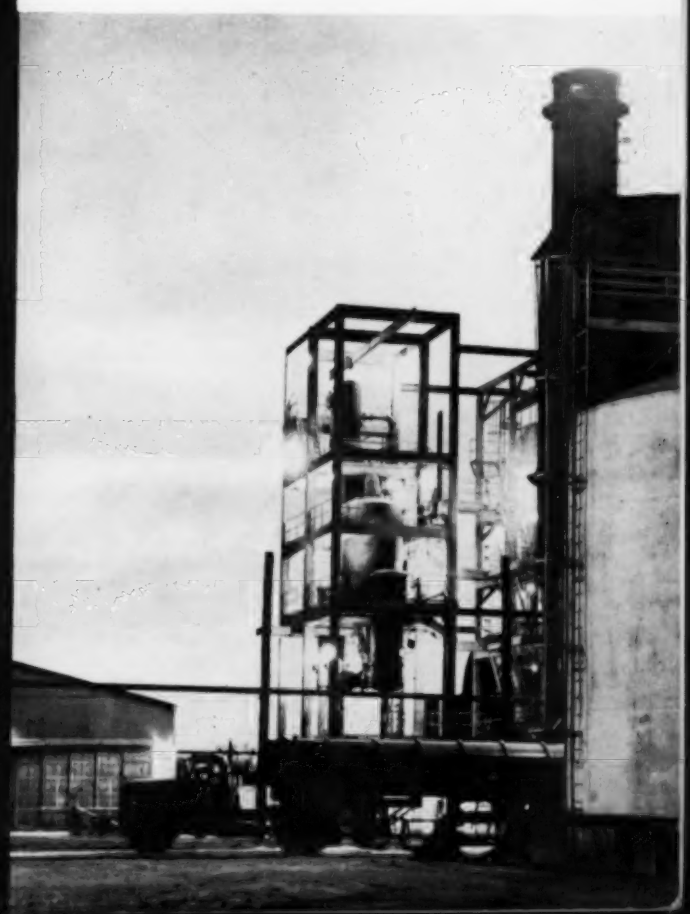
AGRICULTURAL *Chemicals*



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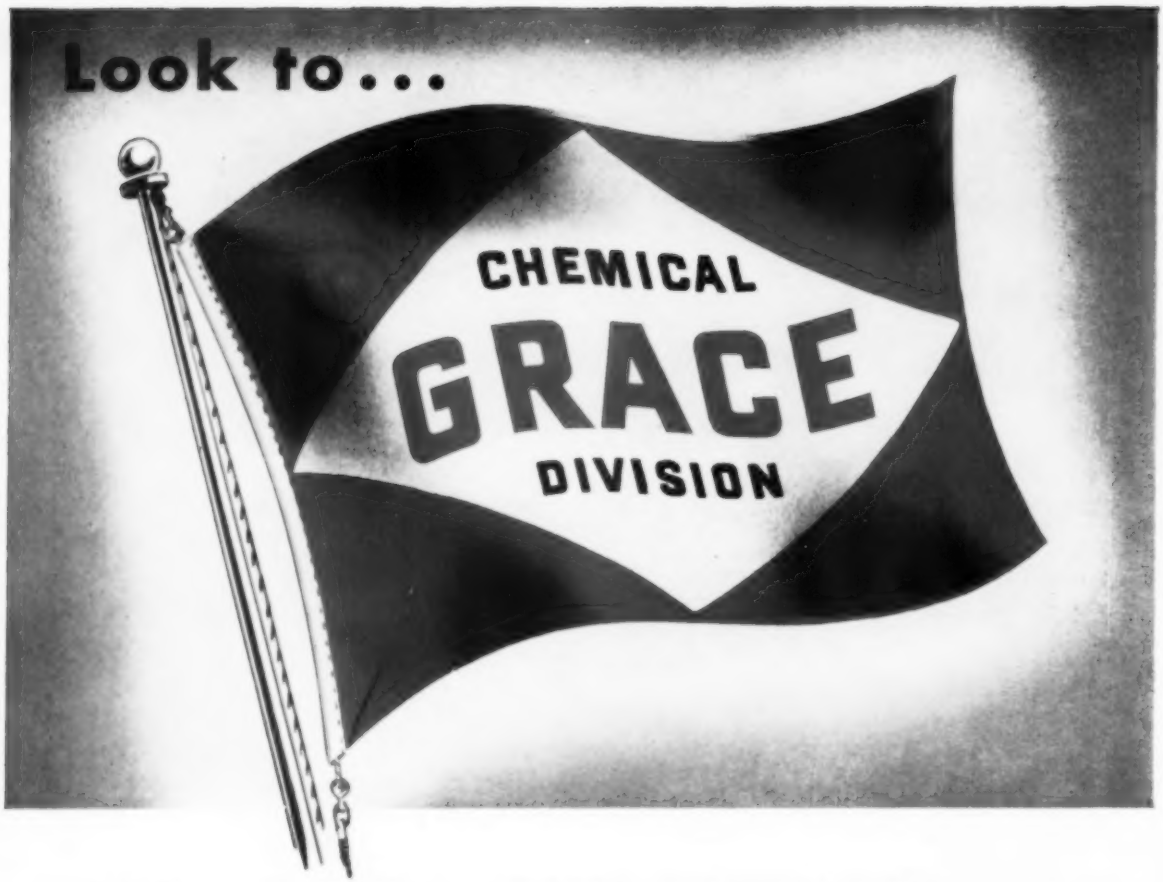

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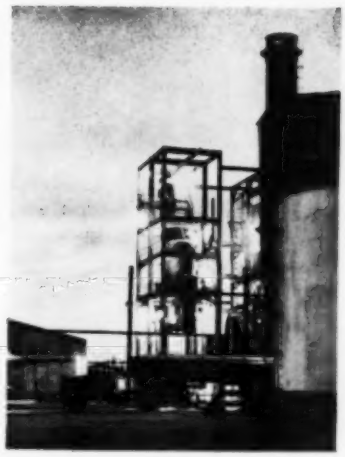

This Month's Cover

Dusk highlights the new primary reactor at Olin Mathieson's Ammo-Phos plant in Pasadena, Texas. This is where ammonia and phosphoric acid are blended to make Ammo-Phos. See page 34.

Vol. 15, No. 6 June, 1960

AGRICULTURAL *Chemicals*

ARTICLES

FEATURES

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another FREE service of the ★ Star Packaging Efficiency Plan!

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National Agricultural Chemicals Association, Association Building, 1145 19th St., N.W., Washington, D. C. Lea Hitchner, exec. sec.

National Plant Food Institute, 1700 K St., N.W., Washington, D. C. Paul Truitt, president.

American Potash Institute, 1102 16th St., N.W., Washington 6, D. C. H. B. Mann, president.

American Society of Agronomy, 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

American Phytopathological Society, S. E. A. McCallan, secretary, Boyce Thompson Institute, Yonkers, N. Y.

American Chemical Society, 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington, D. C. William Horwitz, secretary-treasurer.

Agricultural Ammonia Institute, Hotel Claridge, Room 305, Memphis, Tenn. Jack Criswell, executive vice-president.

American Society of Agricultural Engineers, F. B. Lanham, secretary, 505 Pleasant St., St. Joseph, Mo.

Carolinas-Virginia Pesticide Formulators Association, 516 S. Salisbury St., Raleigh, N. C. Hugh Horn, secretary-treasurer.

California Fertilizer Association, Sidney Bierly, executive secretary, Room 213, Ochsner Building, 719 "K" Street, Sacramento, Calif.

Chemical Specialties Manufacturers Association, 50 East 41st St., New York City. Dr. H. W. Hamilton, secretary.

Entomological Society of America, 4603 Calvert Rd., College Park, Md. R. H. Nelson, secretary.

National Fertilizer Solutions Association, 2217 Tribune Tower, Chicago, Ill. M. F. Collie, secretary.

National Cotton Council, P. O. Box 9905, Memphis, Tenn.

Soil Science Society of America, 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

Sulphur Institute, 1725 K. St., N.W. Washington 6, D. C. Dr. Russell Coleman, president.

Weed Society of America, W. C. Shaw, secretary, Field Crops Research Branch, Beltsville, Md.

Western Agricultural Chemicals Association, Charles Barnard, executive secretary, 2466 Kenwood Ave., San Jose, Calif.

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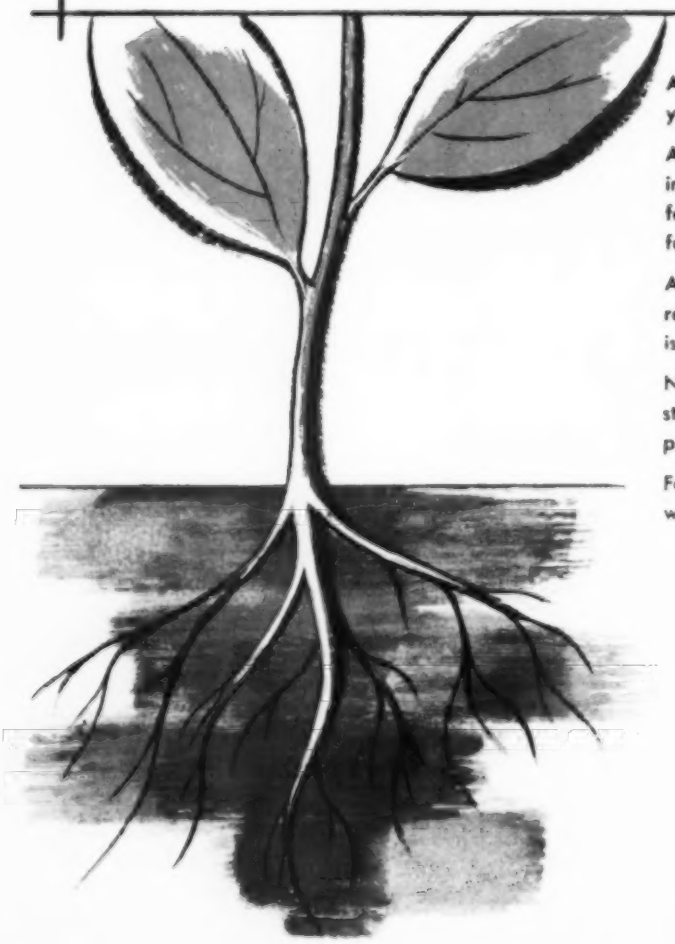

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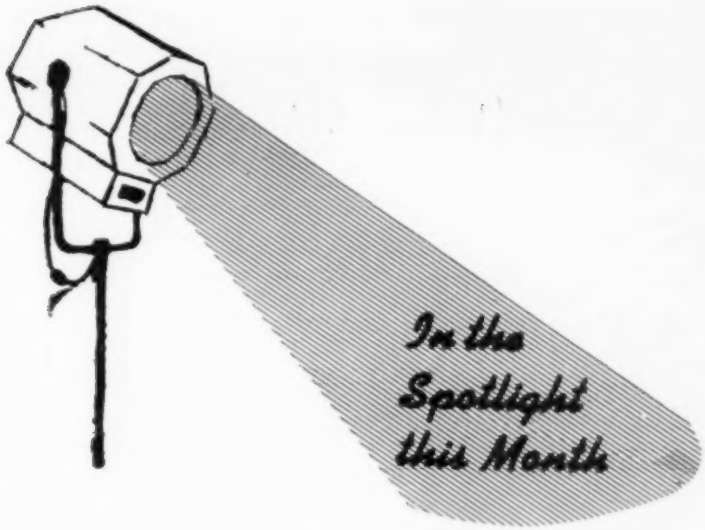

- **Fungicides for Fruit** . . . Although narrow in their range of effectiveness, modern fungicides tend to be more specific than the older copper and sulfur products, which had serious "blind spots." Organic fungicides have been developed which provide protection against diseases where formerly no protection was available. Plant pathologist A. B. Groves reviews properties of some of the new fungicides available for fruit disease control. Page 36.

- **Selling Agricultural Chemicals** . . . Product sales, distributing outlets, technical service, pricing, are among the related factors making up modern marketing programs. "Some random thoughts on selling agricultural chemicals" compiles views of experienced salesmen in the agricultural chemicals industry. Page 42.

- **New High Analysis Plant** . . . Californa Spray Chemical last month dedicated a new fertilizer plant. Main features of the plant are a spherodizer, in which fertilizer pellets are formed and dried simultaneously,—and a prilling process using ammonium nitrate of 99.54% concentration. Page 45.

- **Pesticide Formulation** . . . An experienced formulator observes that the development of a successful pesticide formulation is the result of a combination of science, art, and luck. Several important steps in formulation are based on trial and error methods,—Actual performance tests must be the criteria for final selection of the carrier, surfactant. Page 49.

- **New Fertilizer Grades** . . . A common complaint of the fertilizer plant manager is that it is easy to add a new grade, but difficult to discontinue one. Along with the increasing demand for special fertilizer grades, however, is evidence that requests for special grades are becoming more intelligent, and are based on specific needs. A practical analysis of the problems of producing new fertilizer grades, and how this challenge is being met is featured in this month's production roundtable. Page 57.

- **Aircraft and Aerobiology** . . . In addition to aerial application of chemicals, aircraft are used by plant pathologists in aerobiological research and aerial surveying. Aerobiology is the phase of biology concerned with the origin, kinds, abundance, drift, and ultimate fate of "biological particles" found in the atmosphere. Page 62.

International Market Roundup

TRADING in all materials continued on a very heavy scale, with extremely heavy shipments being made from Europe to Eastern destinations, primarily Communist China and India. Indonesia came into the market for quantities of nitrogen.

As this report is being written, the demand-supply picture is in good balance in Europe and Japan, while the supply position in the United States awaits resolution of weather and other seasonal factors.

Japan

Japan officially awarded foreign exchange under the April/September 1960 potash import budget to cover purchases of 346,900 metric tons of K_2O as muriate and 25,000 metric tons of K_2O as sulphate of potash, from the United States, West Germany, France, Spain, Russia, and Israel. The muriate tonnage exceeded the original budget by about 10,000 tons. The price level of the potash generally was higher than that prevailing at purchases made last October and December.

El Salvador

Considerable interest has been aroused by the intended construction in El Salvador of a fertilizer plant. Discussions are presently underway for construction of a plant to manufacture complex fertilizers. This plant is intended to cover the demand in Central America.

Spain

An interesting situation has developed in this country. Until June of 1959, imports were strictly controlled by the Government and limited, depending upon the Spanish government's foreign exchange resources, as well as their estimate of the actual need. When Spain joined the European Payments Union, it was possible for anyone to bring material in under an open license, with the result that import prices fell drastically. This resulted in the local industry, which produces only approximately 20%-30% of the demand, becoming very much concerned and since that time substantial import duties have been imposed by the Spanish Government.

Imports were made on such a large scale that the country now is overstocked and material now is not only in the hands of normal traders, but also is in the hands of some new elements which are not in the position of regular dealers and which do not have sales organizations. As a result, trade with Spain has slowed down almost to a standstill and it is expected that further imports will be severely curtailed until the considerable surplus of ammonium sulphate has been absorbed into the economy.

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Agricultural insight creates...

new dimensions in service from Sohio

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We'll be looking forward to seeing you at the National Plant Food Institute Convention.

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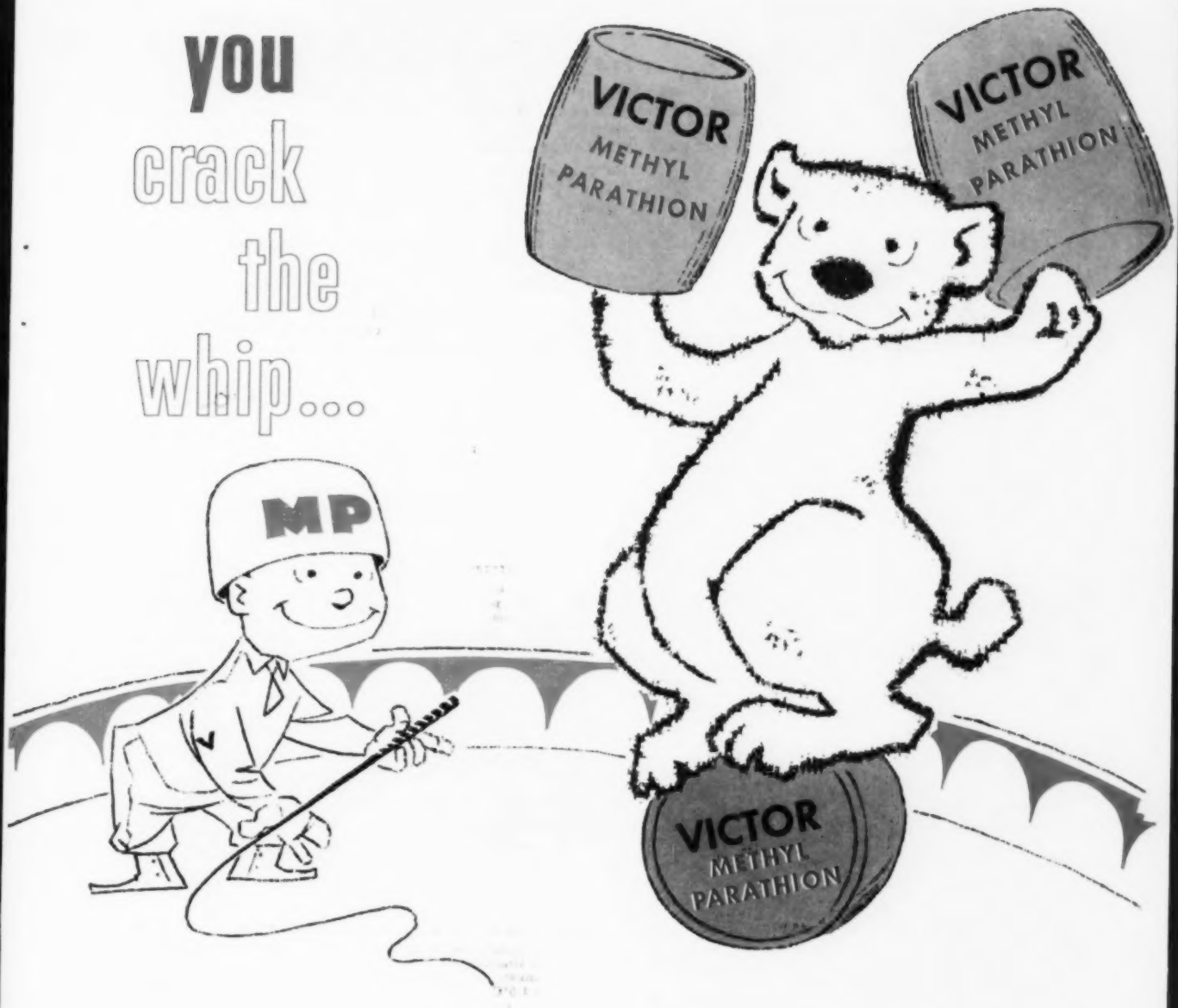

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24

CHLORINATED TOLUENE DERIVATIVES

FOR A NEW STIMULUS TO RESEARCH IMAGINATION

Whet your research imagination by glancing over the 24 structures here!

For your work in organic synthesis, you will find this chart a useful, intriguing guide. Some of these intermediate chemicals have been employed for decades in the preparation of dyestuffs and other organic chemicals. But newer uses are developing with research –

- in the compounding of tranquilizers and antihistamines . . .
- in agricultural chemicals . . .
- as peroxide catalysts for polymerization reactions . . .
- as special solvents . . .
- in the preparation of quaternary ammonium compounds . . .
- as dye carriers . . .

and as intermediates in a wide range of other applications.

Your source for quality chlorotoluene derivatives – Heyden Chemical Division! Greatly expanded facilities at Fords, N. J., insure the service you have come to associate with Heyden.

MOLECULAR WEIGHT: 140.57

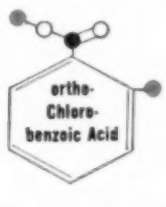
Colorless to slightly yellow liquid which solidifies below 45°F. *Assay:* 97.0% minimum. *Congealing Point:* 7.0°C minimum. *Acidity* as o-Chlorobenzoic Acid: 1.0% maximum.

Uses: Pharmaceuticals. Triphenylmethane dyes. Other organic chemicals.

MOLECULAR WEIGHT: 140.57

Colorless to slightly yellow crystalline solid. *Assay:* 93.0% minimum. *Congealing Point:* 44.0°C minimum.

Uses: Preparation of triphenylmethane and related dyes, preparation of pharmaceuticals. Synthesis of various organic chemicals.



MOLECULAR WEIGHT: 156.57

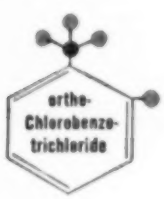
White to slightly yellow crystalline powder. *Assay:* 98.0% minimum. *Ash:* 0.2% maximum. *Congealing Point:* 138.5°C minimum.

Uses: Preparation of pharmaceuticals, dyestuffs, preservatives, agricultural chemicals, and other organic chemicals.

MOLECULAR WEIGHT: 156.57

Coarse off-white powder. *Assay:* 96.0% minimum. *Ash:* 0.2% maximum. *Melting Point,* completely melted: 234.0°C minimum.

Uses: Preparation of pharmaceuticals, dyestuffs, preservatives, agricultural chemicals, and other organic chemicals.



MOLECUEAR WEIGHT: 229.94

Colorless to slightly yellowish low-melting solid. *Congealing Point:* 27°C minimum.

Uses: For the manufacture of pharmaceuticals, dyestuffs, and other organic chemicals.

MOLECULAR WEIGHT: 229.94

Colorless to slightly yellowish liquid which solidifies below 40°F. *Congealing Point:* 3.0°C minimum.

Uses: For the manufacture of pharmaceuticals, dyestuffs, and other organic chemicals.

MOLECULAR WEIGHT: 175.02

Colorless to slightly yellowish liquid. *Specific Gravity,* 25°/25°C: 1.377 minimum. *Congealing Point:* Minus 6.5°C minimum.

Uses: Synthesis of dyestuffs, pharmaceuticals, insecticides, and peroxide catalysts for polymerization reactions.

MOLECULAR WEIGHT: 175.02

Colorless to slightly yellowish liquid which solidifies below 50°F. *Specific Gravity,* 25°/25°C: 1.362 minimum. *Congealing Point:* 10.0°C minimum.

Uses: Synthesis of dyestuffs, pharmaceuticals, insecticides, and peroxide catalysts for polymerization reactions.

MOLECULAR WEIGHT: 161.04

Colorless to pale yellow liquid. *Specific Gravity,* 25°/25°C: 1.272 minimum, 1.287 maximum. *Distilling Range, Drop:* 213°C minimum, *Dry:* 225°C maximum.

Uses: **For synthesis of organic chemicals and preparation of quaternary ammonium compounds.**

MOLECULAR WEIGHT: 161.04

Colorless to slightly yellowish low-melting solid. *Specific Gravity,* 25°/25°C: 1.259 minimum, 1.269 maximum. *Congealing Point:* 25.0°C minimum.

Uses: For synthesis of pharmaceuticals, preparation of quaternary ammonium compounds, and other organic chemicals.

MOLECULAR WEIGHT: 126.59

Clear, practically colorless liquid. *Specific Gravity,* 25°/25°C: 1.078 min. – 1.082 max. *Side Chain Chlorine:* None.

Uses: An intermediate for the manufacture of dyestuffs, pharmaceuticals, rubber chemicals, and other organic chemicals. A "carrier" in the dyeing of synthetic fibers. A special solvent.

MOLECULAR WEIGHT: 126.59

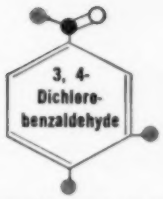
Clear, practically colorless liquid which solidifies below 45°F. *Specific Gravity,* 25°/25°C: 1.067 min., 1.069 max. *Congealing Point:* 6.5°C min. *Side Chain Chlorine:* None.

Uses: An intermediate for the manufacture of dyestuffs, pharmaceuticals, rubber chemicals, and other organic chemicals. A "carrier" in the dyeing of synthetic fibers. A special solvent.

MOLECULAR WEIGHT: 175.02

White to pale yellow crystalline solid. *Congealing Point:* 65.0°C minimum.

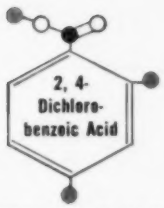
Uses: For synthesis of pharmaceuticals, dyestuffs, and other organic chemicals.



MOLECULAR WEIGHT: 175.02

White to pale yellow crystalline solid. *Congealing Point:* 37.0°C minimum.

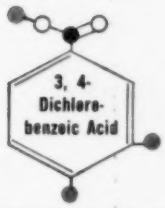
Uses: For synthesis of pharmaceuticals, dyestuffs, and other organic chemicals.



MOLECULAR WEIGHT: 191.02

White to yellowish powder. *Congealing Point:* 158.0°C minimum. *Ash:* 0.2% maximum. *Assay:* 97.0% minimum.

Uses: For preparation of dyestuffs, pharmaceuticals, and other organic chemicals.



MOLECULAR WEIGHT: 191.02

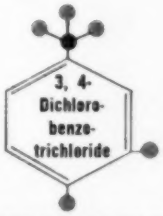
White to yellowish powder. *Congealing Point:* 202°C minimum. *Ash:* 0.2% maximum. *Assay:* 97.0% minimum.

Uses: For preparation of dyestuffs, pharmaceuticals, and other organic chemicals.

MOLECULAR WEIGHT: 264.39

Colorless to pale yellow crystalline solid. *Congealing Point:* 45.0°C minimum.

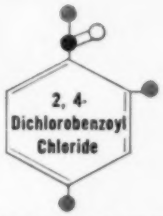
Uses: For synthesis of pharmaceuticals, dyestuffs, and other organic chemicals.



MOLECULAR WEIGHT: 264.39

Colorless to pale yellow liquid which solidifies below 75°F. *Congealing Point:* 23.0°C minimum.

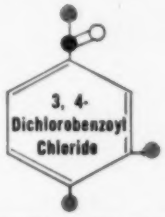
Uses: For synthesis of pharmaceuticals, dyestuffs, and other organic chemicals.



MOLECULAR WEIGHT: 209.47

Clear, colorless to pale yellow liquid which solidifies below 65°F. *Specific Gravity*, 25°/25°C: 1.488 minimum, 1.503 maximum. *Congealing Point:* 16.0°C minimum.

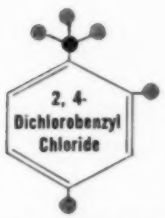
Uses: For synthesis of pharmaceuticals, dyestuffs, peroxide catalysts, and other organic chemicals.



MOLECULAR WEIGHT: 209.47

Colorless to slightly yellowish liquid which solidifies below 75°F. *Specific Gravity*, 25°/25°C: 1.503 minimum, 1.518 maximum. *Congealing Point:* 23.0°C minimum.

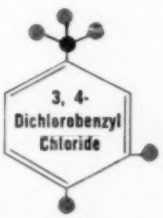
Uses: For synthesis of pharmaceuticals, dyestuffs, insecticides, and other organic chemicals.



MOLECULAR WEIGHT: 195.49

Clear, colorless to pale yellow liquid. *Specific Gravity*, 25°/25°C: 1.408 minimum, 1.418 maximum. *Congealing Point:* Minus 6.5°C minimum.

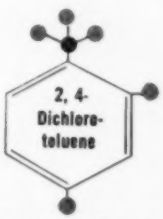
Uses: An intermediate for quaternary ammonium compounds, pharmaceuticals, and other organic chemicals.



MOLECULAR WEIGHT: 195.49

Clear, colorless to pale yellow liquid which solidifies below 35°F. *Specific Gravity*, 25°/25°C: 1.412 minimum, 1.416 maximum. *Congealing Point:* 1.5°C minimum.

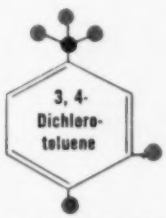
Uses: An intermediate for quaternary ammonium compounds, pharmaceuticals, and other organic chemicals.



MOLECULAR WEIGHT: 161.04

Colorless to pale yellow liquid. *Specific Gravity*, 25°/25°C: 1.247 min., 1.251 max. *Distilling Range:* 199°-202°C. *Side Chain Chlorine:* None.

Uses: For the preparation of dyestuffs, pharmaceuticals, rubber chemicals, and other organic chemicals. A "carrier" in the dyeing of synthetic fibers. A special solvent.



MOLECULAR WEIGHT: 161.04

Colorless to pale yellow liquid. *Specific Gravity*, 25°/25°C: 1.251 min., 1.255 max. *Distilling Range:* 207°-212°C. *Side Chain Chlorine:* None.

Uses: For the preparation of dyestuffs, pharmaceuticals, rubber chemicals, and other organic chemicals. A "carrier" in the dyeing of synthetic fibers. A special solvent.

COLOR CODE:

- White-oxygen
- Green-chlorine
- Red-hydrogen
- Black-carbon

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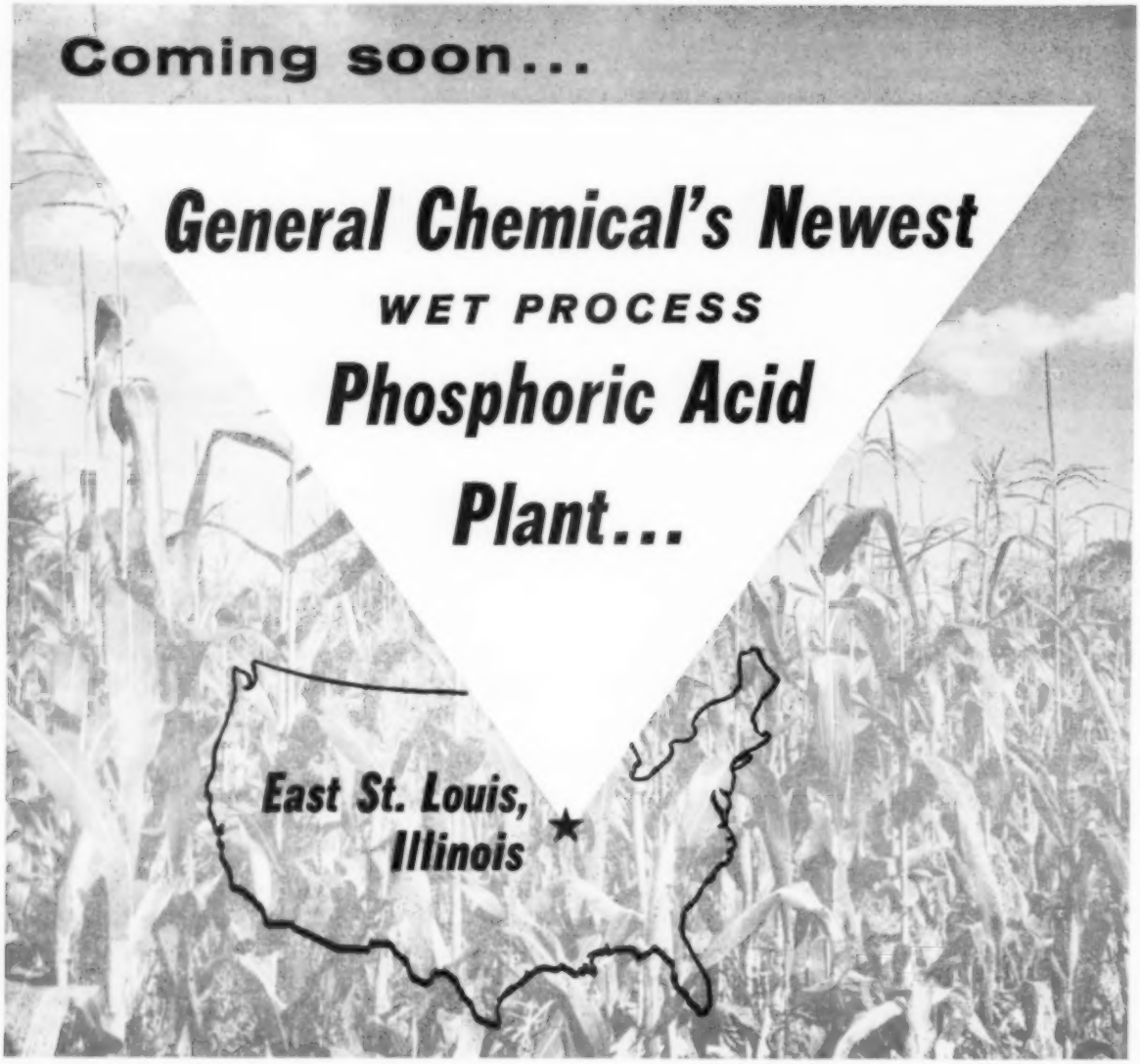

Projected capacity of 50,000 tons per year will be used primarily for manufacturing agricultural fertilizers in the Midwest.

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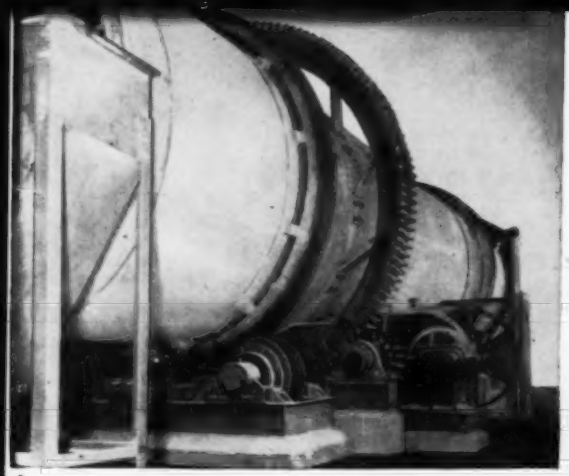

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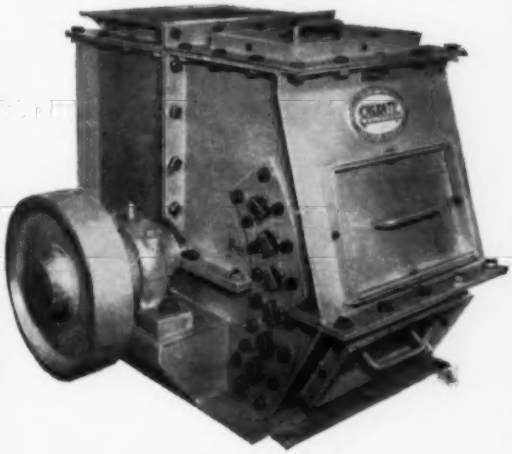

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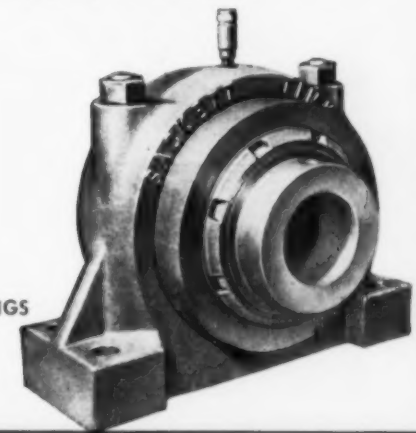

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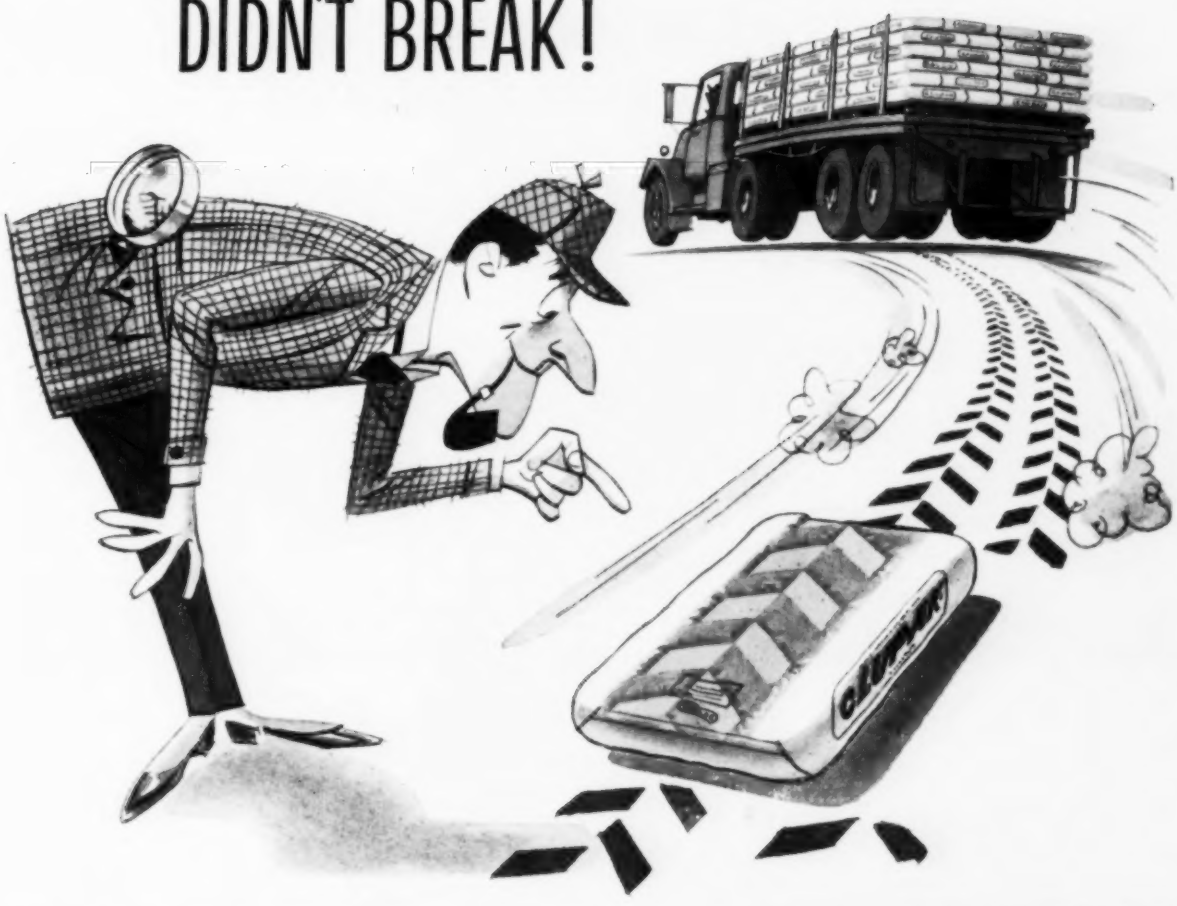

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INDUSTRY MEETING CALENDAR

June 9 — Executive Committee Meeting. Fertilizer Section. National Safety Council. College Inn Motor Lodge. Raleigh. N. C.

June 12-15 — National Plant Food Institute. annual meeting. Greenbrier Hotel. White Sulphur Springs. W. Va.

June 21-22—Southern Feed & Fertilizer Control Officials. Riverside Hotel. Gatlinburg. Tenn.

June 28-30 — Pacific Branch. Entomological Society of America. Davenport Hotel. Spokane. Wash.

July 13-15—Fertilizer Conf. of the Pacific Northwest. Hotel Utah. Salt Lake City.

July 20-21 — Sixth Annual Cornell Weed Day. Cornell University. Ithaca. N. Y.

July 27-30 — Southwest Fertilizer Conf. and Grade Hearing. Galvez Hotel. Galveston. Tex.

Aug. 10-11 — Northeast Regional Fertilizer Safety School. Park Sheraton Hotel. New York.

Aug. 16-17 — Midwest Regional Fertilizer Safety School. National Safety Council Headquarters. Chicago.

Aug. 17-25—XIth International Congress of Entomology. Vienna. Austria.

Aug. 25-27 — Southeast Regional Fertilizer Safety School. Wilmington. N. C.

Aug. 28-31 — Soil Conservation Society of America. 15th annual meeting. Ontario Agricultural College. Guelph. Ontario. Canada.

Sept. 11-14—Canadian Agricultural Chemicals Association. Britannia Lodge. Muskoka. Ontario. Canada.

Sept. 11-16 — American Chemical Society. 138th National Meeting. New York. N. Y.

Sept. 12-14—Entomology Society of Canada. 10th Annual Meeting with Entomology Society of Saskatchewan. Saskatoon. Saskatchewan.

Sept. 24-26 — Western Agricultural Chemicals Association. 31st Annual Meeting. Palm Springs Riviera Hotel. Palm Springs. Calif.

Sept. 27-29 — National Agricultural Chemicals Association. Annual Meeting. Del Coronado Hotel. Coronado. Calif.

Sept. 29-30 — Northeast Fertilizer Conf.. Hotel Hershey. Hershey. Pa.

Oct. 5-6—Southeast Fertilizer Conf.. Atlanta Biltmore Hotel. Atlanta. Ga.

Oct. 10-11 — Four-State Aerial Applicators Conf.. Hotel Chinook. Yakima. Wash.

Oct. 17-18—Fertilizer Section. National Safety Congress. Chicago.

Nov. 3-4—Fertilizer Industry Round Table. Mayflower Hotel. Washington. D. C.

Nov. 3-4 — Pacific Northwest Plant Food Assn.. Annual Convention. Boise. Idaho.

Nov. 13-15 — California Fertilizer Assn.. del Coronado Hotel. Coronado. Calif.

Nov. 28-30 — Soil & Crop Science Society of Florida. Annual Meeting. Fort Harrison Hotel. Clearwater. Fla.

Nov. 28-Dec. 1—Entomological Society of America. 8th Annual Meeting. Haddon Hall Hotel. Atlantic City. N. J.

Dec. 5-7—Carolinas-Virginia Pesticide Formulators Assn. annual meeting. Carolina Hotel. Pinehurst. N. C.

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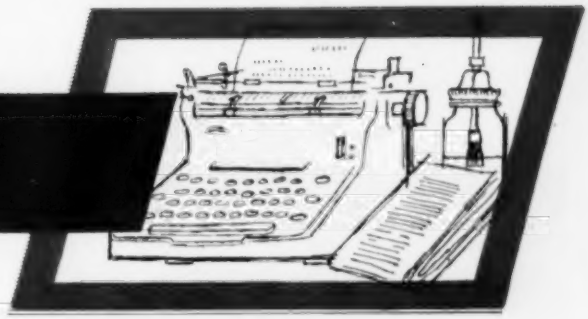
EDITORIALS



THE announcement last month that the U. S. Government will pay $10,000,000 to cranberry growers was made without the fanfare which accompanied Secretary (HEW) Flemming's original pronouncement halting cranberry sales last fall, but its significance is liable to be much more far reaching. The Department of Agriculture has decided that $10.34 per barrel for good quality cranberries would be what growers might have earned without the cranberry scare, and it will pay them the difference between this and what they actually received in the glutted, depressed market that prevailed when the maligned 1959 crop was finally allowed to reach the consumer.

What this can mean for the future is that the Department of Agriculture may at any time be placed in a position where it will have to stand ready to reimburse farmers for losses caused by Secretary Flemming's administration of the Delaney Clause to the 1958 Food Additives Amendment. In addition to cranberries, for instance, the Department of Agriculture is faced with the problem of disposing of 12 million pounds of caponettes which it purchased from producers who were forced to withdraw them from the market after the Food and Drug Administration reported that stilbestrol fed to the birds had caused cancer in rats.

The possibility of serious repercussions resulting from this lack of coordination between two agencies of the government was brought into painful focus last month by the U-2 spy plane incident and the subsequent, tragic collapse of the Paris Summit conference. While the cranberry incident cannot be likened in seriousness to the Summit collapse, repeated versions of it could turn out to be quite costly, monetarily. They already threaten to bring to a halt the development of new pesticides. Many manufacturers now are reluctant to invest valuable time and money in development and testing of products that may at any moment have to be arbitrarily withdrawn from the market because of sensational news releases and carefully staged press conferences.

(*Continued on Page* 99)

THE optimistic outlook for future fertilizer sales is reflected in the industry's preparation to meet an anticipated growing demand. This past month, two of the largest fertilizer plants ever built, were launched in dedication ceremonies (see pages 34, 35 for Olin Mathieson's new plant, and pages 41, 42 for Calspray's west coast plant).

It is particularly significant that both plants are designed to manufacture complex, high analysis, granulated fertilizers, and both are of high capacity. Also, both mammoth new plants are located outside the areas that used to be thought of as the center of the fertilizer industry. A steadily widening use of a different type fertilizer is becoming more and more apparent.

TVA has just predicted that by 1975 U. S. fertilizer consumption will reach 10 million tons of primary plant nutrients annually, an increase of over 50 per cent from the 6.5 million tons currently in use. When one considers that in 1950 the consumption of primary plant nutrients was only four million tons, it is quite impressive how far the industry has come,—and what an ambitious future still lies ahead.

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Cashing in on—or Trading Up with Your Trade Association

by Paul Truitt
President
National Plant Food Institute

MEMBERSHIP in the National Plant Food Institute, the trade association of the fertilizer industry, is paying greater dividends today than ever before. Lawyers may call this a "self-serving declaration," but results in hand are proof positive.

There are first-rate reasons why the Institute has attained consistent support from its members and has grown in stature through service. The Institute:

- Performs many essential services more effectively and more economically than could its members acting individually.
- Offers a program which is a dominant force for expanding the domestic fertilizer market.
- Promotes and protects the interests of the fertilizer industry in matters of governmental affairs and regulations.
- Promotes and supports research in fertilizer technology and methods of analysis designed to save the industry millions of dollars annually.

Staff members of the Institute are working men around the council tables of agriculture. They aid in giving direction to agricultural programs, and they share in common the goals of agricultural leaders in their efforts to improve the economic well-being of farmers.

The Institute's program is founded on the philosophy that projects, programs and promotions with all agricultural groups must be in the best interests of farmers or they are not in the best interests of the industry that serves farmers. This philosophy is sound!

There are intangibles involved in membership in the Institute, but on the other hand, there are projects which may be reported in terms of accomplishments. Space will permit the mention of a few of these.

Since World War II, general freight rate increases have amounted to 135 per cent, potash freight rate increases have been held down to 47 per cent and phosphate rock, to only 38 per cent. This represents lower costs to members and their customers from the Institute's effort to achieve realistic freight rates on plant foods.

Tours of selected operations of the fertilizer industry for agricultural writers and scientists have brought these individuals, and through them, their readers, a better understanding of the importance of more profitable farming with fertilizer.

A project to save manufacturers several million dollars per year in plant food overages, by getting uniform chemical control, is another thrifty Institute project.

On request, the Institute provides practical information on soil fertility to more than 1,240 radio stations, four times per year, representing the largest farm radio network in the United States. Through radio programs the Institute, with sixteen messages per year, reaches millions of farmers.

In one regional Institute office alone,

(*Continued on Page* 116)

Olin Mathieson

Addition to Ammo-Phos Plant Makes It World's Largest

A newly-constructed section gives the plant a capacity of more than one ton of pelletized fertilizer per minute—a 40 per cent gain over former output — making it the largest high-analysis fertilizer plant in the world. Among the grades added to the Ammo-Phos line as a result of the expansion are: 15-15-15, 16-48-0, 14-28-14, 7-28-28, 9-36-18, 13-39-13, and 12-24-24.

Located adjacent to extensive rail and water shipping facilities, the plant is ideally situated both from the standpoint of receiving raw materials and delivering finished products.

PRODUCTION in the world's largest high-analysis fertilizer plant began May 11 at Pasadena, Texas, when S. L. Nevins, vice president of Olin Mathieson Chemical Corp., formally activated a $1,500,000 addition to an existing plant on the Houston Ship Channel in Pasadena.

The newly-constructed section gives the plant a capacity of more than a ton of pelletized fertilizer every minute – a 40 per cent gain over former output. Mr. Nevins dedicated the plant addition in the hope that it would "help toward satisfying the food needs of an expanding population throughout the world." Mr. Nevins is regarded as one of the leaders in the high analysis fertilizer field. He started the nation's first production of ammonium phosphate type fertilizers in Pasadena 14 years ago for Southern Acid & Sulfur Co., which later became part of Olin Mathieson.

With its location on the Houston Ship Channel, a man-made deep water channel extending 57 miles fom Houston to the open waters of the Gulf of Mexico, the Pasadena plant is ideally situated both from the standpoint of shipping in raw materials and shipping out finished products.

Phosphate rock comes by water from the Tampa, Fla., area. Gulf vessels with capacities of about 10,000 tons can unload at the plant and smaller quantities can come in by barge through inland waterways that border the Gulf Coast.

The plant manufactures its own sulfuric acid from sulfur obtained nearby and ammonia comes by rail from the corporation's facilities at Lake Charles, La., about 150 miles to the east. Potash comes by rail from the Carlsbad area of New Mexico.

Ammo-Phos, the high-analysis fertilizer produced at Pasadena, moves in ocean-going vessels around the tip of Florida to the east coast where Olin Mathieson has fertilizer manufacturing and distributing facilities at Williamston, N. C., Baltimore, Md., and Lebanon, Pa. Ocean-going vessels also take Ammo-Phos to the Indies, South America, and to the Orient by way of the Panama Canal.

By inland waterway, the product moves up the Mississippi, Ohio, Tennessee, Missouri, and Illinois Rivers. It also is possible to use the inland waterway eastward across the Gulf Coast to Mobile and then up the Tombigbee and Warrior Rivers to Tuscaloosa and Birmingham, Ala.

The Olin Mathieson plant is one of more than 200 industrial plants that line the Houston Ship Channel, the depth of which is 36 ft. and its width varies from 300 to 400 ft. With the new addition to the plant, Olin Mathieson is adding new grades to its Ammo-Phos line. Among them are 15-15-15, 16-48-0, 14-28-14, 7-28-28, 9-36-18, 13-39-13, and 12-24-24.

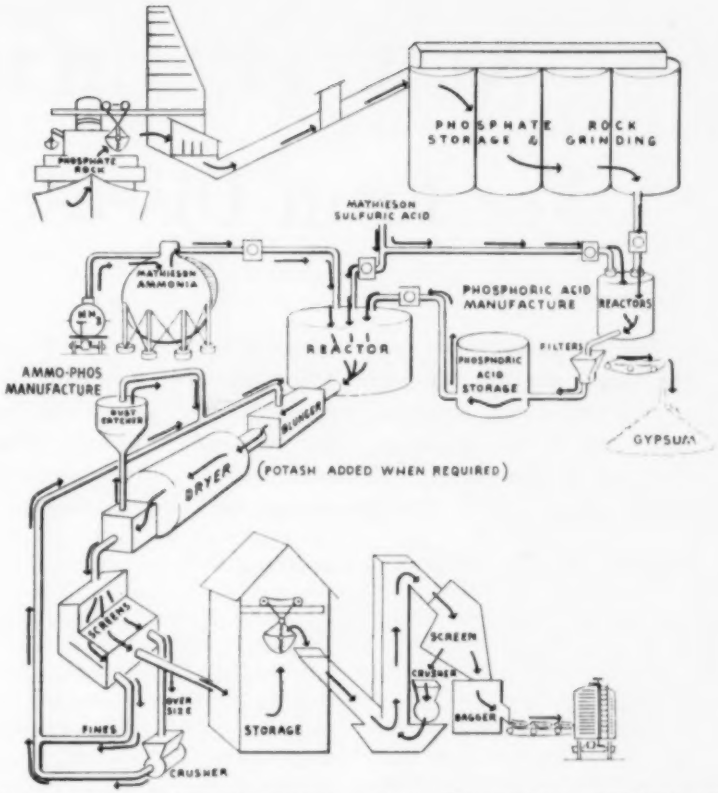
Dr. Tyrus R. Timm, head of the Department of Agricultural Economics and Sociology at Texas A & M College, College Station, was the main speaker at the "start-up" ceremonies. He said that the crop needs of the United States will double in the next 50 years. "According to recent studies by the United States Department of Agriculture," he said, "our population is projected to 370 million by the year 2010. At that time, utilization of livestock and livestock products is expected to be about 2.5 times today's utilization."

There will be further commercialization of agriculture, he said, with units getting larger, and investments and operating expenditures bigger; but there is little evidence of a great movement to large, corporation farming or ranching, generally.

"The agricultural industry will not occupy a much smaller share of the general business picture," he said. "The business of agriculture was about 40 per cent of the total volume of business in general a number of years ago and remains that today." Referring to government agriculture programs of the future, Dr. Timm said that they will change only gradually and will "be here for a long period of time."

An authority in agriculture and sociology, Dr. Timm was agricultural relations advisor to the O.P.A. during World War II. He presently is a member of a six-man national advisory committee appointed to appraise crop and livestock estimates of the U. S. Department of Agriculture.

The accompanying flow diagram of a high-analysis fertilizer plant shows the manufacturing method used by Olin Mathieson in the manufacture of its Ammo-Phos pelletized fertilizer at Pasadena.★



This flow diagram shows the process used by Olin Mathieson in manufacturing its Ammo-Phos pelletized fertilizer. Phosphate rock comes from Florida and, following grinding, it is mixed with sulfuric acid, obtained from an adjacent plant. The resulting phosphoric acid then is reacted with ammonia from O-M's Lake Charles, La., plant. The mixture goes to a blunger where ammonium phosphate pellets are formed and potash is added if required.

NEW FUNGICIDES—
For Fruit Disease Control

The fruit industry has come to depend upon the newer organic fungicides for protection against infectious diseases of fruit and foliage. They have displaced older materials, because of superior disease control and lessened phytotoxicity, with consequent higher yields of quality fruit. This is not to suggest, however, that all disease control problems have been met. More effective materials, fungicides effective against a wider range of fungi, and better adaptability to mixed fruit plantings would be welcomed.

THERE has been an almost complete change during the past decade in the fungicides used in fruit disease control. Prior to that time, reliance was almost wholly on sulfur products and compounds of copper. Sulfur fungicides were used early in the season, Bordeaux mixture and fixed coppers during the heat of the summer. Ferbam alone was among organic fungicides which had found acceptance, and was used rather widely.

Fruit growers shifted to the newer fungicides because they were superior. Their greater cost was demonstrably more than offset by the advantages of superior disease control and lessened phytotoxicity.

Let us examine the matter of fungicidal effectiveness. The older sulfur and copper fungicides had serious "blind spots" in their range of effectiveness. The newer fungicides tend to be specifics, more narrow in their range of effectiveness. This is a generalization and not applicable in many instances, of course. Organic fungicides provide protection against diseases where formerly no protection was available. This is best illustrated by the cedar apple and quince rusts, where ferbam has provided excellent protection. Thiram and zineb formulations have also proved useful against these diseases. With the general abandonment of cedar cutting as a control measure, there is reason to assume that demands for fungicidal protection will increase in this field in the future.

The apple diseases against which fungicidal protection is normally required include scab, cedar apple and quince rusts, mildew, black rot, botryosphaeria rot, Brooks spot, bitter rot, sooty blotch and fly speck. Lesser diseases include black pox, botrytis blossom infection, blotch and blister spot.

More attention is given to the control of scab than any other apple disease. A number of protectant fungicides are used against the disease, the principal ones being captan, dichlone, ferbam and glyodin. Mercury containing fungicide formulations, principally phenylmercury acetate, and phenylmercury-triethanol ammonium lactate, are used widely as infection eradicants, when it has been impossible to maintain a protective program. They are also used in combination with protective fungicides, particularly ferbam and glyodin. Both the protectant and eradicant are used at reduced strengths in such a program. Methylmercury - 8 - hydroxyquinolinate gives promise of minimizing the threat to fruit set, which has been a troublesome feature of mercury containing fungicides when used in excessive dosages, in closely repeated applications or under high temperatures.

Dodine (Cyprex) is now available to the fruit grower and experience with it is accumulating. Experience to date indicates it to be the most effective scab fungicide available, but it may not be as free of phytotoxic potential as materials presently in common use. The use of dodine on apples is limited to pre-bloom and early post bloom sprays. While later use would be desirable under some circumstances, this use should generally suffice to carry an orchard through the critical primary scab infection period. The control of early or primary scab is the key to scab control for the season. Dodine is also highly effective against cherry leaf spot. It is not effective against the fruit rots, including black rot of apples and brown rot of the stone fruits.

The apple rusts are a major consideration in much of the apple growing areas of the East and Midwest. Ferbam is usually the fungicide of choice for the control of rusts, although thiram and zineb are also used. One of these fungicides must be added to the captan, dichlone, dodine, or glyodin fun-

gicide used primarily for scab control in order to extend the protection to include rusts. The rate of usage of the dithiocarbamate fungicide under such circumstances is usually about one half normal fungicidal strength. Ferbam may cause injury to the finish of yellow varieties even at this time, and the less phytotoxic and somewhat less effective thiram is frequently substituted. Thiram is also frequently used as the only early season fungicide on Golden Delicious, where rust is a problem.

The weakest spot in the fungicidal protection of apples in the middle Atlantic states and the middle west has been protection against the late season rots. Part of this has been due to shortcomings in the schedule and in orchard sanitation. Captan has been used widely and effectively. Captan's shortcoming has been a short residual life. Combinations of captan and zineb have helped to correct this problem. Ferbam and thiram have not always been satisfactory against the apple rots. Phaltan, which does not yet have clearance for use on fruit, gives much promise as a late season fungicide. The material has been effective against the fruit rots in widespread tests and is awaited by the fruit industry. Phaltan's effective fungicidal life is longer than that of captan, but it has more pronounced phytotoxic tendencies. Phaltan has also shown promise against cherry leaf spot, and may prove useful on this fruit, especially where brown rot and bitter rot are troublesome problems.

Powdery mildew is a disease which appears early and spreads as new growth develops. None of the commonly used scab fungicides are effective against powdery mildew. Both are commonly employed, sulfur being used at minimal rates early, and in situations where the possibility of sulfur sun scald is accepted as a hazard in its use. Karathane has a short residual life and has some injury potential under high temperature conditions, although less than sulfur. Mildew is a disease which developed rapidly in many orchards, following the abandonment of sulfur, and shift to the organic fungicides. It now seems obvious that protection against this disease must be maintained on susceptible varieties over much of the apple growing regions.

by A. B. Groves

Winchester Fruit Research Laboratory
Winchester, Va.

Brooks spot, sooty blotch and fly speck are minor diseases which are controlled by any program adequate for general disease control. Sooty blotch and fly speck began to appear commonly in the early years, following the shift from bordeaux mixture to the organic fungicides. What was at first suspected of being a lack of specific fungicidal effectiveness, particularly on the part of captan, was later demonstrated to be a much shorter residual life than Bordeaux mixture and the lead arsenate, which frequently accompanied it. Program adjustments have compensated for differences in residual life.

No fungicide available to date will control every apple disease. Mixtures of fungicides are suggested for grower use and are widely employed. Industry formulations of fungicide mixtures include Phybam-S and the Niacides. Further possibilities in the use of fungicide mixtures seem apparent and attention is being given to them.

Protective fungicides are also indispensable in the production of stone fruits. Captan is used widely and satisfactorily for the control of brown rot, the most troublesome disease of peaches. Dichlone is also used for the control of the early or blossom blight stage of brown rot, but is not considered satisfactory for late season use. Thiram is also used to a limited extent, and is useful against gray mold (Botrytis).

The first spray of the season on peaches is directed against leaf curl. Lime sulfur and bordeaux mixture, long time standards, are still used, but are giving way to ferbam and the phenylmercury fungicides.

Peach spray programs are commonly based on sulfur, captan or an early-to-late sequence of these two fungicides. Such a program is normally adequate for the control of peach scab as well as brown rot. Mildew on peaches has appeared in the East in recent years, with the introduction of a few highly susceptible varieties. Sulfur seems the preferred fungicide under such circumstances.

Special peach disease problems for which there is no adequate remedy at present, include the constriction disease and bacteriosis. Late season use of organic fungicides may prove helpful against the former, and recent work by Diener and Carlton in Alabama indicates promise for the control of bacteriosis with a combination of captan and dodine.

Leaf spot is the most important disease of the sour cherry. The organic fungicides have displaced the older copper and sulfur fungicides here too. Mixtures of ferbam, glyodin and actidione are used. Captan alone is inadequate in serious leaf spot situations. Where used with an effective adhesive, captan formulations have been effective and are also useful against the cherry fruit rots. Dodine is highly effective against cherry leaf spot, but inadequate against the rots.

Streptomycin formulations, bactericidal rather than fungicidal, have been of substantial assistance in controlling fire blight of pome fruits. It has not provided the whole answer to the control of fire blight, a bacterial disease. Streptomycin has been of little use against bacteriosis on stone fruits, a disease

(*Continued on Page* 109)

AGRICULTURAL PESTICIDES
Featured on C.S.M.A. Program

Big problem of the garden pesticide industry is the poor job it has done on consumer education, C.S.M.A. members told. Producers of small package garden pesticides have done an excellent job of formulating efficient pest control products, — but have failed to tell the consumer what is available.

The answer, one authority believes, is the multipurpose product, named by function as rose dust, vegetable spray, etc. This would remove some of the confusion in the consumer's mind, and help build sales.

Other discussions before the Insecticide Division of CSMA concerned public reaction to use of agricultural chemicals, effect of public law 86-139 on the manufacture of all pesticides, and analytical methods for detection of pesticide residues in milk and meat.

THE home gardening market for 1959 represented an outlay of some 2½ billion dollars, yet spending for garden pesticides and fertilizers during that year amounted to only about $200,000, — less than 10% of the total, reported Dr. Harry L. Haynes of the Union Carbide Consumer Products Company, New York, in addressing the 46th mid-year meeting of the Chemical Specialties Manufacturers Association, — held May 15-17 at the Drake Hotel, Chicago.

"How do we increase this figure?", asked Dr. Haynes, and answered his own question by recommending that the industry acquire a "better understanding of the need for and use of pesticides by the home gardener." Dr. Haynes indicated that the overall problem in the garden pesticide industry is that the consumer has not been fully informed of the "true value of our products". "We have not told the consumer in the simplest terms what we have available for him, how easy it actually is for him to combat the vast majority of his pest problems, and how he can accomplish this without wasting too much effort or concern.

"He can obtain a multiplicity of excellent multipurpose products to handle practically all of his garden problems, but he has to be better educated or informed about the products made available to him.

"The industry has learned that the consumer needs a product to control all his pests on a specific commodity such as roses, evergreens or lawns," advised Dr. Haynes. "It is possible to provide this broad multipurpose function. Consequently, the industry, in cooperation with agricultural experiment stations and the U.S.D.A., has developed broad multipurpose products that will control the majority of pests and diseases which plague the home gardener. We as experts can easily recognize that it can take two to four years to develop this multipurpose mixture which will be compatible, useful and safe on plants. All of us are aware of the time and development costs. I just wish the consumer knew, realized or appreciated what he is getting in that simple little package. I also wish we could get him to know that the name of the product and label directions represent the culmination of years of experiments and expert interpretation by specialists around the country."

Dr. Haynes pointed out the error of the educational program directed toward making the layman a "plant doctor" or pest control expert. It is confusing to suggest insecticide X for aphids and caterpillars, fungicide Y for mildew and black spot, — etc. With such instruction, the consumer goes to the store and reads labels. "He finds insecticide X in a rose dust, a fruit tree spray and a vegetable dust. Fungicide Y is found in a tomato dust, and in a floral spray. Which product does he buy? . . . It is not surprising that he doesn't buy anything, and may leave the store a little confused or with the wrong product."

Dr. Haynes recommended that the industry concentrate on promotion of multipurpose products, named according to their function. For example, a fruit tree spray, a rose dust, a lawn weed killer, etc. Naming of multipurpose products by association with use, would remove some of the confusion in the consumer's mind, — and a look at modern garden products shows that more of this is being done today. "There are of course some exceptions to functional naming", explained Dr. Haynes. "Some pesticides which possess unusually wide spectrum activity, plus low mammalian toxicity have been associated with specific pest control by ex-

cellent national advertising. Chlordane and malathion are examples."

Most modern garden pesticides are formulated to handle a variety of pests on a specific garden plant. The formulator of a small package garden pesticide has anticipated the major problems of the home gardener, and worked the solution into a top quality product. A floral dust, for example, usually contains DDT, malathion, captan and sulfur. It can be applied directly as a dust or diluted in water as a spray. It can be applied to a few dozen varieties of flowers found in a home garden, and controls the most destructive foliage feeding insects which attack flowers and shrubs. Such a multipurpose product has a phytotoxicity safety factor of at least 2, and usually 3 to 4,—and furthermore will most likely control the pest, disease or insect even if underdosed by one-half.

Dr. Haynes points out that having prepared such an excellent product, "we should certainly impart this knowledge to the consumer. We could provide the gardener and ourselves a service if we could motivate him to just dust or spray his roses, flowers, fruit trees weekly until they are past flowering, or up to an appropriate time before harvesting of fruit. In particular, we in the small package industry should strive to make the backyard gardener realize that all he needs to do is to buy a reliable multipurpose rose dust or spray and use it regularly. He should be made to understand that his major problems have been anticipated and answered in this one product."

Another phase of the garden pesticide industry, which still needs a lot of attention, said Dr. Haynes, "is making the consumer aware of the importance of properly applying his pesticides. There are many good applicators, such as hand dusters and sprayers, hose end units, 3-5 gallon pump up sprayers, and power equipment for the less conventional size homes, — and little excuse for not applying pesticides correctly. Still pesticide manufacturers must be concerned with application, since even an excellent product can leave a dissatisfied customer when the product is not properly applied."

Dr. Haynes concluded his report with the observation that "the industry can greatly assist the promotion of its products to satisfied customers by spreading the message to "Enjoy yourself, — make your gardens beautiful using our quality pesticides in a reliable sprayer; don't worry, leave the complicated biological and technical problems to us".

A report on "Pesticide Formulation — A Carrier-Producer's Viewpoint," by Garth Coombs, Johns-Manville, Manville Research Center, Manville, N.J., attracted considerable attention. It is reported in full on pages 47-50 of this issue.

Weed Killers and Public Reaction

IN an address dealing with the public reaction to agricultural chemicals, Jack Dreessen, National Agricultural Chemicals Association, warned CSMA members that "A growing portion of the public is becoming unduly fearful of the use of pest control chemicals. Adverse and unfounded criticisms of scientific research in our field, and the wide dissemination of such misstatements are leaving their mark. There has been an increase in proposed restrictive legislation, but more important, more and more people are accepting these statements as fact and are tending to discredit the sound, scientific developments of the past few years.

"Lack of knowledge on the part of some scientists and others who speak out of their own fields, adds to public confusion and fear over very serious questions," continued Mr. Dreessen. "For the public, lacking knowledge needed to make a sound judgment on many scientific questions, must rely on information given them, and warnings made, by reputable scientists and public officials. Such information can counsel reasonableness, or it can excite widespread fear among some, hostility among others, and lack of confidence in public officials on the part of others."

If we are to survive the present age, emphasized Mr. Dreessen, those in power must exercise more reasonable judgment, and more wisdom in making public statements. They must give consideration to all factors in making decisions in the best interest of the public.

In citing specific cases, Mr. Dreessen pointed out that until a few months ago, most Americans considered chemical weed killers as curiosity items that they used occasionally to kill dandelions. They were mystified at the way 2,4-D would kill broad-leaf plants in their lawns, and angered when the same chemical treatment did not kill crabgrass. For the most part, however, herbicides were hailed as effective, efficient farming aids. Their use resulted in tremendous reductions in weed populations and hand labor requirements in a number of crops.

Administration of P.L. 86-139

JOHN T. Coyne, USDA, Pesticides Regulation Branch, reported to CSMA members the most recent developments in the administration of Public Law 86-139. The effect of this law, he explained, is to subject such chemicals as nematocides, plant regulators, defoliants and desiccants, to the same Federal regulatory provisions that govern agricultural chemicals. The term "plant regulator," he explained is precisely defined to exclude plant nutrients, trace elements and soil amendments. The term "nematode" is so defined as to bring within the jurisdiction of the law only those nematodes which are pests of plants or plant parts. Nematodes which are animal parasites are intended to be excluded.

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NPFI at the Greenbrier

Fertilizer Technology—Sales and are among features Scheduled for the National Plant Food Institute

SPEAKERS from the fields of agriculture, education, business, and industry are featured in the program announced for the 1960 convention of the National Plant Food Institute, to be held June 12-15 at The Greenbrier, White Sulphur Springs, W.Va. Paul T. Truitt, NPFI president, will preside at the sessions, which begin with a morning program on June 13th. Richard E. Bennett, chairman of the NPFI Board of Directors, will deliver an Address of Welcome.

Also on the June 13th morning will be a report by Dr. Clifford N. Hardin, on "Education, Firm Hope for Agriculture"; and an address by Arthur H. Motley on "The Political Responsibility of the Business Community."

The afternoon program for June 13th will feature the Institute's "Chemical Control Project," with Dr. Vincent Sauchelli as moderator. Participating in the panel discussions will be: E. M. Glocker, and Stacy B. Randle, who will report on, "Magruder Check Fertilizer Samples—New Series"; C. H. Russell and J. R. Archer are sched-

Guest

Paul Truitt, NPFI President

R. E. Bennett, NPFI Board Chairman

Clifford Hardin
Univ. of Nebraska and president of American Association of Land-Grant Colleges and State Universities

James Thomas
Patterson, Ga. president of Future Farmers of America

At left, viewpoint Greenbrier Hotel in White Sulphur Springs W. Va., where NPFI annually holds its convention in June.

Dealer Psychology— the convention of at White Sulphur

uled to review the NPFI Manual on Standarized Methods of Analysis.

A panel discussion on the "In-Plant Shrinkage Study" will include comments on an "Analysis

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SUNDAY, June 12

9:30 a.m.—Registration.
4:00 p.m.—Ladies' Garden Party.
5:00 p.m.—Meeting of the Hospitality Committee.

MONDAY, June 13

9:00 a.m.—Registration.
9:30 a.m.—General Session, *Paul T. Truitt*, President, NPFI presiding.
Address of Welcome, *Richard E. Bennett*, Chairman, Board of Directors, National Plant Food Institute.
"Education, Firm Hope For Agriculture," *Dr. Clifford M. Hardin*, President American Association of Land Grant Colleges and State Universities, and Chancellor, University of Nebraska.
"A Future Farmer Looks at His Future in Agriculture," *Jim Thomas*, President, Future Farmers of America.
"The Political Responsibility of the Business Community," *Arthur H. Motley*, President, Chamber of Commerce of the United States.
Memorial Resolution, *Hugo Riemer*, Chairman, Memorial Committee
Annual Business Meeting of the Membership, *Mr. Bennett*, presiding.
11:00 a.m.—Special Ladies' Program.
2:00 p.m.—Technical Session.
Panel, "Report on Natl. Plant Food Inst. Chemical Control Project." Moderator, *Dr. Vincent Sauchelli*, Chemical Technologist, National Plant Food Institute; "Magruder Check Fertilizer Samples—New Series," *E. M. Glocker*, W. R. Grace & Co., and *Stacy B. Randle*, President, Association of American Fertilizer Control Officials, and State Chemist, New Jersey Agricultural Experiment Station; "National Plant Food Institute Manual on Standardized Methods of Analysis," *C. H. Russell*, Monsanto Chemical Co. and *J. R. Archer*, International Minerals & Chemical Corp.
Panel Discussion, "In-Plant Shrinkage Study." Moderator, *Dr. Sauchelli;* "Analysis of Causes," *Dale C. Kieffer*, Smith-Douglass Company, Inc.; "Possible Remedies," *Albert Spillman*, Fertilizer Manufacturing Cooperatives, Inc.
6:30 p.m.—Hospitality Hour, Courtesy of Nitrogen Producers.
9:30 p.m.—Open House and Country Party.

TUESDAY, June 14

9:00 a.m.—Registration.
9:30 a.m.—General Session, *Paul T. Truitt*, presiding.
Film Presentation, "Bread from Stone," latest movie production of the National Plant Food Institute.
"Are You Taking Full Advantage of Your NPFI Membership?", *Tracy Adcock*, Advisory Committee on Merchandising the NPFI Program.
Presentation, "Soil Management Awards for Editors," *Richard E. Bennett*.
"Dealer Characteristics Survey," *Drs. Joseph Bohlen* and *George Beal*, Department of Agricultural Economics and Rural Sociology, Iowa State University.
"What a Dealer Should Know," *Murray Renick*, Rolla Feed Mills.
"Everything Depends on Sales," *Ralph Everett*, Sales Training Consultant.
6:00 p.m.—Hospitality Hour, Courtesy of Potash Producers.
7:30 p.m.—Annual Banquet.

Speakers on NPFI Convention Program

Arthur H. Motley
president of the Chamber of Commerce of the U. S.
New York City

Vincent Sauchelli
chemical technologist
National Plant Food Institute
Washington, D. C.

George M. Beal
Iowa State University

J. M. Bohlen
Iowa State University

Murray Rennick
Rolla Feed Mills
Rolla, Mo.

Ralph Everett
sales training consultant
Miami, Fla.

Some Random Thoughts On...

Sales and Selling In The Agricultural Chemicals Field

Selling and distributing insecticides and fertilizers (at the manufacturer's level) involves problems and methods exclusive to the agricultural chemicals industry. For example, many in the industry feel that general line salesmen cannot successfully handle agricultural chemicals. They believe it takes a staff of specially trained representatives, who possess the desired "know how," — of the industry, its products, and it personalities.

Opinions of some of the top sales executives in the industry are summarized in the following.

BACK 30 or 40 years ago, before so many of the top personnel of our big companies in the agricultural chemical field had been exposed to college marketing courses, selling was a much more simple procedure than it seems to be today.

The expert was the sales manager, who had learned the subject by direct experience with mixers, formulators and farmers out in the field,—and not some sales psychologist, or perhaps a college professor who gets his "sales pointers" out of books.

In those days you hired a big, dynamic, aggressive, appealing "sales type," — gave him a short course of instruction on the company products,—a strong pep talk, —a limited expense account,—and sent him out on the road to shift for himself. If he came back with the orders, he had demonstrated himself to be a salesman. If he didn't produce, he went back to whatever he had been doing before. It was that simple! Every company that was to survive had to build up a sales staff, and almost always did so by a simple trial and error procedure.

Over recent years, however, selling has been succeeded by the science of "Marketing," which has achieved a mysterious and glamorous position, — in the agricultural chemical industry as in every other. It has grouped around itself such related facets as: Product Sales,— Distributing Outlets, — Technical Service,—Consideration of Pricing, etc.

Marketing today is fashionable,—and it seems that in many cases it has become an industry by itself, instead of a tool used by all industries.

There are no more "born" salesmen. The salesman himself is not supposed to exercise too much individual initiative, but rather must at every step of the way, follow the preconceived plan of the marketing expert. This expert, of course, has obtained his sales training from the high priests,—and is in the favored position of knowing just what the factors are that influence the buyer, just when and under what stimuli said buyer may be counted upon to make up his mind the time has come to sign the order.

And in modern marketing theories, of course, little allowance is made for human variables. All buyers are assumed to be responsive to the same stimuli, — every salesman is supposed to follow the same sales pattern, he uses the same sales approach on every potential buyer . . . and we get the impression that instead of having a sales staff, it might be just as well to feed the data into an electronic brain, and let it turn out the orders.

As a corollary to this rise of the marketing expert has come the ascension of the advertising expert in the ag chemical field. Through lengthy detailed studies, the experts in this companion field to sales have discovered that buyers are not in the market year round, but are only responsive to a well placed sales story at rather obscure intervals.

They (the advertising experts) have learned that the only time the mixer, formulator or farmer can be sold a particular product is during a very brief period . . . perhaps the first two weeks after the second rain in April. Accordingly, they wait until their figures tell them the buyer should be just ready to sign the order,—then they fire all their guns on this carefully selected date. What makes them the experts, of course, is that their studies have taught them this date is the right one. Then they simply

relax the rest of the year, because the same studies have taught them that only 2% of sales are made outside the period indicated.

Some of our " experts" insist the only time to advertise is during the mixing season (in the case of the mixer and formulator) or the applicating season (in the case of the farmer), when the prospective buyer is actually buying. Another group has studies to show that, while the actual buying may be done during the mixing or applicating season. the decision on what to buy is made during the off season, when the buyer has more time to read and plan for the busy months ahead.

We still can't seem to get away from the idea ourselves, — that any selling is a year round job . . . 5 days a week and 52 weeks a year. And that the most successful salesman or sales force, within its potential, is the one that keeps hammering away for orders, week in and week out.

We're also dedicated to the idea that, since there are myriads of different types of buyers, — a similar wide variety of sales types and approaches can be used successfully in selling them. They used to tell us years ago that the most successful sales type was the big, aggressive, fast talking, domineering, foot-in-the-door individual. But we have seen just as many hot salesmen who were little, inconspicuous, mild mannered, hat-in-hand types.

Some salesmen can spiel off a canned presentation and make it produce orders. Others depend on the varied individual approach, and, for them, the pat sales talk would be suicide.

There is undoubtedly a lot of practical information in modern marketing theories which merits study. Intelligent evaluation and application of these theories can undoubtedly do a great deal toward the development of a successful sales program.

Recently, this observer had an opportunity to attend a round table and workshop on "Marketing Industrial Products," at which some of the basic principles were discussed by representatives of companies in the chemical specialty industry. The comments and suggestions of these practicing specialists are summarized below:

Introducing a New Industrial Product

THERE is general agreement that the trade can best be reached on a new product through publicity and advertisements in trade magazines and other paid media. Specific markets should be aimed at, rather than trying to reach multiple markets with a single all-purpose program.

How much to spend? The concensus of this particular group indicates that less than one per cent of the gross dollar sale is generally spent for advertising and promotion. These specialists feel, however, that this amount is considerably less than adequate. Estimates of 2 to 3% of the gross dollar were ventured as more nearly meeting advertising budget requirements for industrial products.

One speaker emphasized that, out of any such advertising and sales promotion budget, at least 10% should be allocated to sell the various intermediate hands or distributing agencies along the road to the end consumer.

In other words, if a budget of $750,000 is contemplated for advertising a new fertilizer to the home garden market, or a new rodenticide to the farmer, etc., at least 10% of this total should be spent to reach and pre-sell the formulator and mixer, the distributor and dealer, the county agent and farm advisor.

Spending at least 10% of the total advertising budget in this direction, they assert, increases very substantially the result to be gained from the remaining 90% invested in direct consumer copy, and is insurance at a nominal figure that the bulk of the budget will not be simply cast on dry, untilled ground. For, they emphasize, unles formulators and mixers are sufficiently impressed with the new product to adopt it, — unless distributors and dealers stock and handle it, — unles county agents, farm advisors and experiment station personnel know enough about the new material to feel disposed to recommend it, — advertising to the end user can readily fall on hard, uncultivated, barren ground.

Where a highly technical product, or one particularly unique in application is to be launched, greatest success has been obtained with advertisements in specific market trade papers, followed by introduction through specialty product men, — thereafter, sales handled through the regular sales force.

In all cases, trade media advertisements and announcements serve to pave the way for the specialty or regular sales force.

After a product is thus introduced, it is considered ready for offering to the distributor or manufacturer's sales organization for their handling and servicing.

Shall we sell direct, — or through dealers? There are strong advocates in the agricultural chemical industry for both approaches. This article summarizes some of the arguments — pro and con!

Direct Sales vs Distributor Sales

THE manufacturer of an industrial product must consider, on an individual basis, the advantages and disadvantages of dealing through jobbers or distributors as compared with han-

dling sales directly. There is no set of rules that can apply equally to all products, or all companies.

In favor of direct sales are such factors as better control of the product and immediate knowledge of reaction by the customer. The manufacturer has a better opportunity to provide specific usage information, and forestall misuse or misapplication.

In selling direct, the selling cost is estimated at about 35 per cent . . . in addition it must be kept in mind that to this must be added the investment in cost of credit to thousands of small accounts. The question of direct vs dealer sales finds avid support for both sides. Some participants in the "marketing workshop" indicated that direct selling is not economically sound for them, while others observed that the number of end customers is a very critical factor in the question of whether or not to sell direct.

Aside from the credit question, other factors favoring distributor sales are: multiple distribution, effective means of handling small deliveries and capitalizing on local prestige of the jobbers and local service.

As to establishing a distributor, it was agreed that the distributor should, of course, be selected for ability to perform in a given area and in keeping with variations in the handling of competitive products. The immediate reaction to this suggestion is recognition of the problem of finding a distributor who specializes in a particular market area, and who handles associated products to the same industry.

Manufacturers are cautioned against trying to play both fields in a territory,—i.e. handling direct sales to readily known accounts, leaving 'marginal' accounts for the distributor. In the first place, it is doubtful that a distributor can be located who will handle products on anything but an exclusive basis. In the final analysis, it is essential that a manufacturer work with his sales force (including the distributor) rather than against it.

Another speaker raised the point that the modern trend is to limit the number of distributors rather closely. One reason nobody made much out of sales of such basic products as DDT and BHC was that they were too freely available, – and readily became price footballs. The modern trend is certainly to keep good new products in the hands of strong distributors, who can be counted on to keep profit margins high enough so that they can afford to spend at least something on promoting the product.

Shipping

THE method of distributing products, either on an f.o.b. or prepaid basis, is generally controlled by the competitive factors and economic conditions. Today, more than ever, industrial manufacturers are looking to each individual sale to produce a profit, and they are of course inclined to pass up sales which show a loss.

Round table participants agreed that freight equalization is a costly process from an office handling standpoint,—and that there is often some debate over the correctness of rates charged. With an increase in chemical formulating and mixing plants throughout the country, delivered prices (manufacturer absorbing freight cost) will become more prominent.

Pricing

THE competitive market generally establishes the price level for a given product group. Where a new product is introduced, it should be priced to show a profit equal to that in a similar group of products. Round table participants agreed that unless a manufacturer can get a 20% return on his investment (after taxes), he would do well to forget entering into competition. The greatest margin of profit will be realized by the industry through the development of new and unique items, rather than depending on the old standard low margin "me too" products.

If the basic producer decides to sell direct, should he entrust his new product to general line salesmen, or train a fresh staff of specialty salesmen? The answer to this question, at least in the agricultural chemical field, seems to be strongly in favor of the specialized sales staff.

This is a field, most all agree, that you don't walk into abruptly armed with just a B.Chem. or a degree in business administration, —and no experience in the industry. Over the years, say the top sales managers, they have seen the salesman with a knowledge of the industry, and a wide acquaintance where it counts, outsell the marketing school experts two to one.

Servicing an Industrial Product

OPINIONS vary considerably as to how much technical assistance can profitably be given to customers. It is felt that engineering service can best be furnished on an "advice" basis rather than on a consulting basis. A more practical outlook is to give as much

(*Continued on Page* 118)

- ***Is there any longer a "sales type"?***
- ***Shall we sell from a set "presentation"?***
- ***What is the importance of the "seasonal factor" in selling fertilizers and pesticides?***

. . . . A number of opinions of industry experts are summarized!

California Spray-Chemical Corp. Dedicates New Fertilizer Plant

150 T/D Fertilizer Grade Prilled Ammonium Nitrate Plant

A complete line of liquid and dry fertilizers, including "Ortho" high-analysis, pelleted plant foods, will be produced at the Kennewick, Wash., plant, designed by engineers of the Chemical & Industrial Corp. of Cincinnati, Ohio.

ANTICIPATING the continuation of further major expansion in the agricultural chemicals industry in the west, California Spray Chemical Corp. recently built and put into production a new $5-million fertilizer plant in Kennewick, Washington. Formal dedication ceremonies took place May 17th, with governors of 11 western states in attendance.

The new plant is designed to produce a complete line of liquid and dry fertilizers, including "Ortho" high-analysis pelleted plant foods. The Kennewick plant site was selected because of its strategic location so far as shipping connections are concerned, and an unlimited supply of water from the Columbia River.

The three major segments of the plant (described below) were designed and constructed by Chemical and Industrial Corp. of Cincinnati, Ohio. All three segments went on stream prior to their scheduled date, and represent the most modern plants of this type available.

Nitric Acid Plant

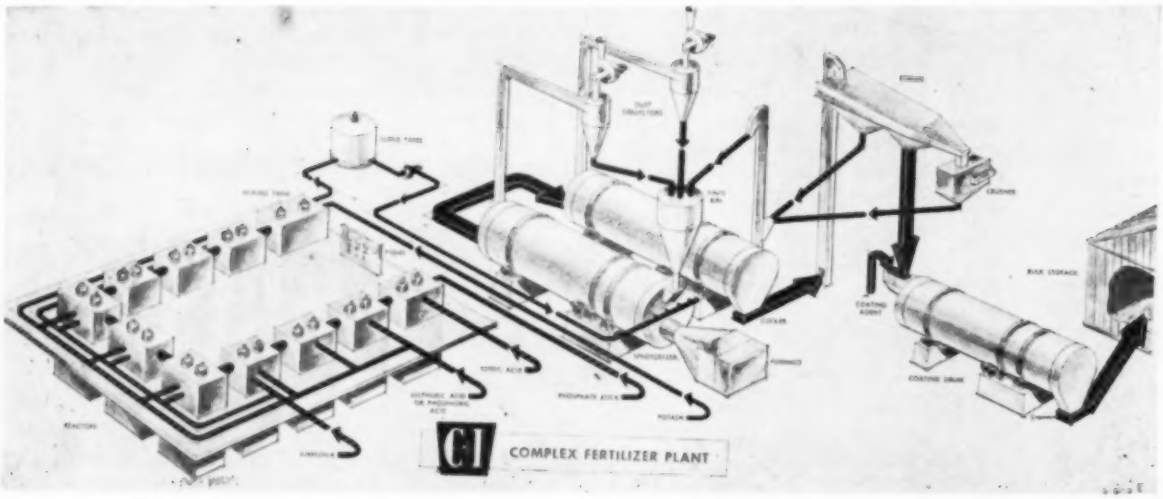
The nitric acid section is a C & I high pressure designed plant, a modification of the duPont process, in which ammonia is burned and the oxides formed are absorbed under pressure. The Kennewick nitric acid plant has a daily capacity of 150 tons of nitric acid on a 100% basis, produced at a 57% concentration.

Spent gas, consisting primarily of nitrogen, is reheated and used to drive the expansion turbine, thus furnishing a large portion of the required operating power of the plant at minimum cost.

Prilling and Solutions Plant

The second segment of the Kennewick plant consists of the ammonium nitrate prilling plant, solutions section, and ammonium nitrate solutions plant. The prilling plant is based on Chemical & Industrial's new prilling process. The nitrate melt entering the tower is almost anhydrous, and therefore needs only a small distance of free fall for the pellet to solidify completely. The prilling tower need be only about one-third the height of conventional towers that prill an ammonium nitrate solution at a concentration of 95-96%. Overall height of the C & I designed tower is about 60'.

This portion of the plant has a daily capacity of 150 tons of fertilizer grade prilled ammonium nitrate and can make, simultaneously, quantities of ammonium ni-



This flow sheet illustrates how the complex fertilizer plant incorporates the PEC acidulating and ammoniating section along with C & I's patented spherodizer, which pelletizes the slurry after it has been mixed in the first section of the plant. The plant can produce any fertilizer grade, and the nitrophosphate product that is produced will be tailored to the needs of crops grown in the northwest. Pellets produced in the process are said to be unusually dry.

trate-ammonia solutions and other fortified nitrogen solutions.

The plant and process are designed for possible incorporation of urea into the nitrogen solutions.

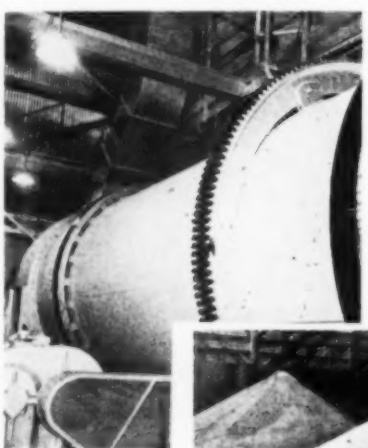
Complex Fertilizer Plant

The complex fertilizer plant (diagram shown above), incorporates the PEC acidulating and ammoniating section along with C & I's patented spherodizer, which pelletizes the slurry after it has been mixed in the first section of the plant. The plant can produce any fertilizer grade, and the nitrophosphate product that is produced will be tailored to the needs of crops grown in the northwest.

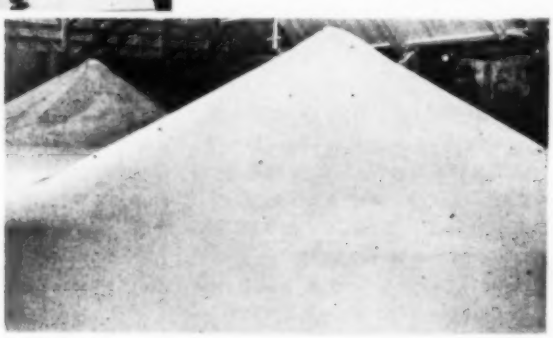
Acidulation of phosphate rock and ammoniation are carried out in a series of stainless steel vessels, which are water-jacketed and provided with motor-driven agitators. Nitric acid and phosphate rock are added to the first three vessels, and the slurry flows continuously through the acidulation and ammoniation vessels, which are connected in series.

From the final ammoniation vessel, the slurry flows to a slurry mixing tank, and then to the slurry surge tank, where potash is added, and sufficient time is allowed for all chemical reactions. The slurry is then sprayed into the spherodizer under pressure, where it is pelletized and dried. This process differs from other granulating methods in that the pellet formation and drying are carried on simultaneously. This is accomplished by continuously spraying the feed slurry onto curtains of falling particles, showered through hot drying gases in the rotating drum. The pellets build up in a painting or onion skin fashion, through accumulation of successive coats.

Chemical and Industrial engineers maintain that the pellets produced by their process are unusually dry, and thus can be stored in bulk. Also, they assert that uniformity is particularly good, and minimum classification is needed. One of the advantages of use of the spherodizer is reported to be a very low recycle rate.★



Left: Side view of the C&I Spherodizer that pelletizes and dries the slurry in Cal-Spray's fertilizer plant.



Below: Complex fertilizer is shown in bulk storage at the Kennewick, Washington, plant. Pellets produced by the C&I process are unusually dry, a factor that permits them to be stored in bulk.

PESTICIDE FORMULATION

. . . as seen by a producer of carriers

Trial and error still is an important part of developing a successful pesticide formulation. Laboratory methods can be employed to test carriers and predict their toxicant compatibility,—yet the ultimate test is actual storage.

Experience has shown that following the "rule of thumb" generally correlates the sorptivity of the carriers with the set-point or melting point range of the toxicant. Selection of other ingredients, such as the surfactant, also is made pretty much on an "it-has-worked-before" basis. And compromise sometimes is required when no carrier provides 100 per cent results.

After limited field trials, the final step is larger-than- laboratory-scale production testing, then extensive field testing. Once satisfactory production runs have been made, the formulation can be adjusted to balance production cost and product performance.

by Garth Coombs
Johns-Manville Corporation
Manville, New Jersey

THE development of successful pesticide formulations is the result of a combination of science, art, and luck. With the correct application of these, toxicants advance from the chemist's bench to the biologist's greenhouse or fields for tests. With improper formulation, potentially good poisons may not give optimum results during biological tests, and may end up on the shelf instead of on the market.

The need for effective formulation is accentuated by the tremendous dollar investment required to find toxic compounds, screen their effectiveness, and develop the necessary field information for registration. In addition, the economic hazards of insect resistance and of competitive products always are near. Months of research effort should not be wasted because of insufficient formulation effort. Hardman and Thomas state that " . . . adequate evaluation in the field of a new toxicant poorly formulated cannot be made."[1] W. Duyfjes puts it another way; " . . . incorrect formulation will

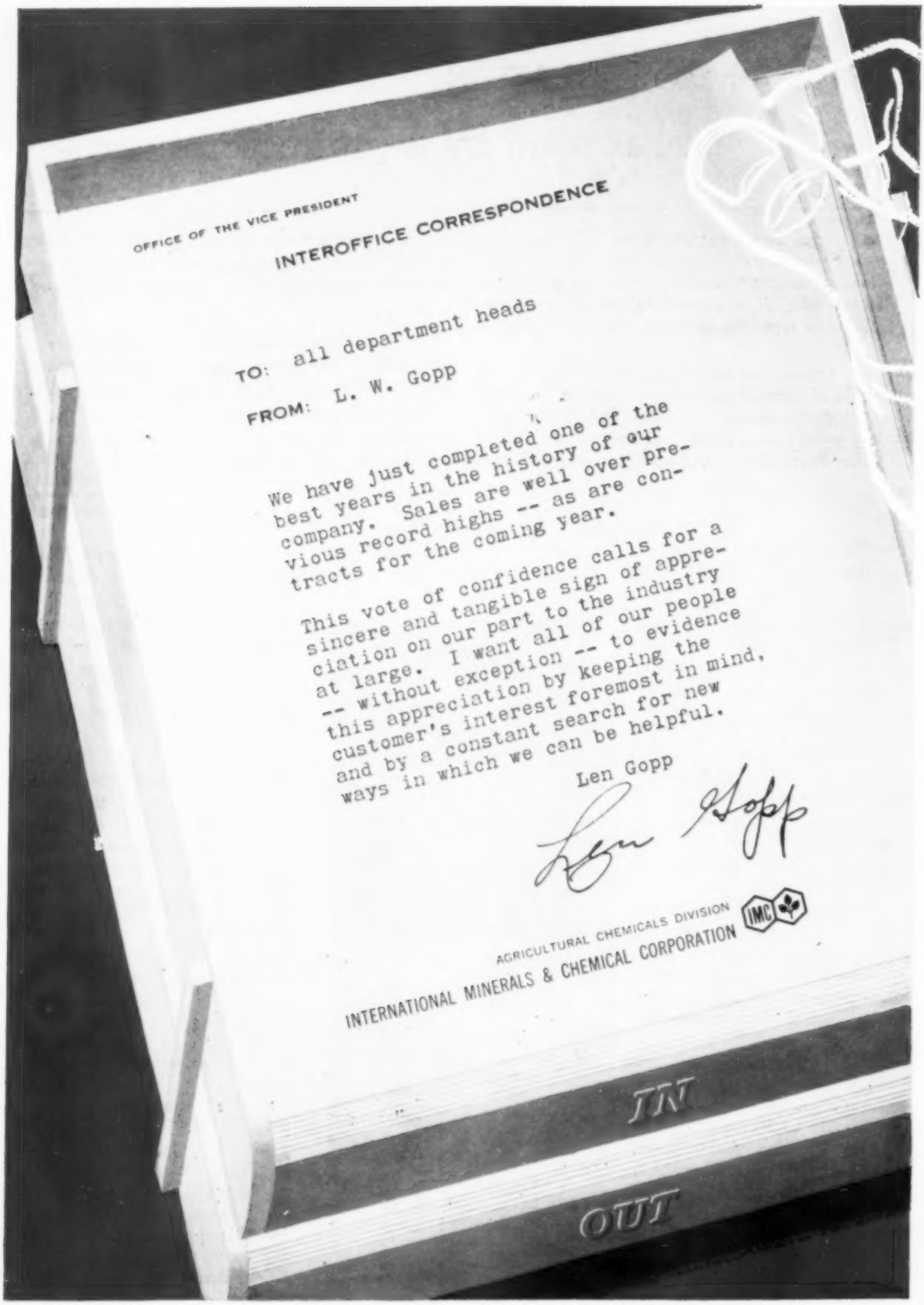
make a useless product of a good pesticide."[2]

An understanding of many factors is required to optimize the chance of developing a good formulation. Some of these are: a) the biology of the pests and hosts, b) the characteristics of available production and application equipment, c) the toxicology of the pesticide in relation to plants, animals, and humans, d) the characteristics and relation to performance of the available formulation ingredients, and e) the cost of the formulation on a unit-available toxicant basis as related to the potential market and to competitive products.

These factors might be summarized as the biological and the physical aspects of the formulation.

Few organizations can afford the time to develop full knowledge concerning all the foregoing aspects of formulation. It is therefore useful to take advantage of the experience of the suppliers of the ingredients used in formulations. As a producer of diatomaceous earth (Celite) and synthetic calcium silicate (Micro-Cel) products, the Johns-Manville Corporation has found it desirable to undertake such a formulation service. By cooperative formulation studies with pesticide producers, it has been possible for Johns-Manville's knowledge concerning the application of J-M products to be added to the pesticide producer's knowledge of desirable product characteristics, and thereby come up with formulations that have given good field

*Presented at the 46th mid-year meeting of the Chemical Specialties Manufacturer's Association, Chicago, May 16-18, 1960.


OFFICE OF THE VICE PRESIDENT
INTEROFFICE CORRESPONDENCE
TO: all department heads
FROM: L. W. Gopp
We have just completed one of the best years in the history of our company. Sales are well over previous record highs -- as are contracts for the coming year.
This vote of confidence calls for a sincere and tangible sign of appreciation on our part to the industry at large. I want all of our people -- without exception -- to evidence this appreciation by keeping the customer's interest foremost in mind, and by a constant search for new ways in which we can be helpful.
Len Gopp
Len Gopp
AGRICULTURAL CHEMICALS DIVISION
INTERNATIONAL MINERALS & CHEMICAL CORPORATION
IMC
IN
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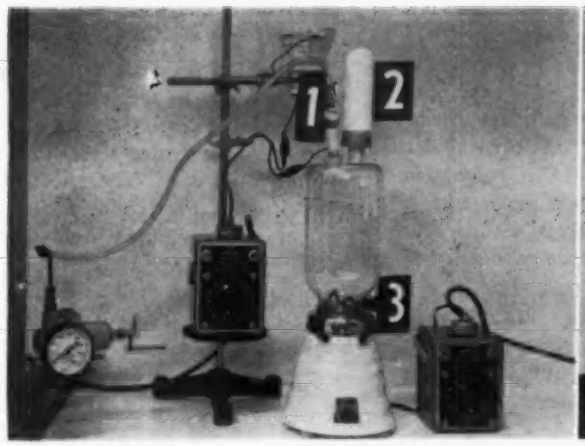

Figure 1. Modified Osterizer Spray Apparatus.
1. DeVilbiss Air Atomizer and Heated Feed Funnel.
2. Extraction Thimble Vent.
3. Modified Osterizer Blades.

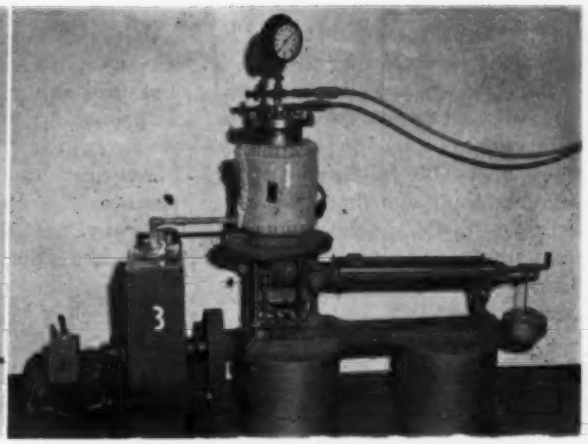

Figure 2. One-gallon Ribbon Blender Spray Apparatus.
1. Pressure Spray Pot with Heating Mantle.
2. Tee Jet Pressure Atomizing Nozzles and Solenoid Cut-off Valve.
3. One-gallon Variable Speed Ribbon Blender.

results from both a physical and a biological viewpoint.

Johns-Manville's experience has been with the physical aspects of formulations, particularly wettable powders and dust concentrates. The following is a discussion of these physical aspects and our approach to these formulation studies.

The objective in formulating a wettable powder or dust concentrate is to convert the technical pesticide into a particulate form, that, when diluted with either water or inert solids respectively, may be distributed so as to achieve the desired biological control. The ideal formulation must be suited for a range of conditions of application equipment, concentration, water hardness, water temperature, and type of foliage surface. The ideal formulation also should have the particle size range that assures optimum results. In addition, the ideal wettable powder formulation should have suitable properties of wettability, deflocculation, sprayability, foliage adherence, etc. Finally, the ideal formulation must maintain all these properties even after prolonged storage under adverse conditions.

FORMULATION STEPS:

With these objectives in mind, what are the typical steps involved in developing a wettable powder formulation? Obviously each particular formulation has its own peculiar problems, but certain aspects or considerations apply to most cases. Our formulation procedure is based on a cooperative effort between Johns-Manville as a carrier producer and the pesticide manufacturer, who is interested in developing a satisfactory formulation.

1. Establish Desired Product Performance:

The first step is to establish the desired product performance by joint discussion with the pesticide manufacturer or formulator. This discussion must consider the expected properties of the formulation, particularly in relation to method of application and limitations on methods or facilities for production. Generally, limits can be set for certain properties from the manufacturers' knowledge of the biology of the pests and toxicant. For instance, approximate particle size range, wettability, suspendability, and storage stability may be known or estimated.

Of equal importance to knowledge of which standards should be met is knowledge of how these tests should be run. Test methods vary, and in many cases this variation is enough to give noticeable differences in results. The WHO method serves as a widely known reference method, but it is not well suited for domestic formulations.[3] Some properties, such as flowability, impose an additional problem in that there are a number of test methods available but few, if any, are realistic for the full range of powder densities and equipment designs met in the agricultural field.

This discussion with the interested personnel is naturally general, but is designed to serve as a guide for developing suitable properties in a formulation, so that it will meet the biological requirements.

2. Preliminary Compatibility Studies:

The second step in developing a formulation is to begin establishing the compatibility or stability of the toxicant and the "inerts" under consideration. Obviously it would be unsatisfactory to develop a formulation in which part or all of the toxicant was decomposed, because of some chemical or catalytic reaction with the "inerts". Normally, stability is evaluated by an accelerated test at elevated temperatures that has been, or is being, correlated with long-term tests under actual temperature conditions.

Several laboratory methods are used to test carriers or "inerts" and to predict their toxicant compatibility. These include determination of pKa,[4] pH, moisture content, and ion exchange capacity.[5] These methods have given reason-

able correlations with some toxicants. However, the ultimate test is actual storage. Occasionally, satisfactory carriers are eliminated on the basis of laboratory tests of this type, and yet later long-term tests show reasonable stability. Also, a compromise is sometimes required when no carrier provides 100 per cent results. The use of deactivators,[6] if known, becomes necessary in some cases.

3. Establish Concentration Limits:

For Carriers and Prepare a "Blank" Blend:

The third step is to evaluate the effects of varying the proportions of toxicant, carrier, and diluents, while temporarily omitting the surface-active agents from the formulation. This is done by preparing small test batches and comparing particle size, flowability, grindability, caking resistance, etc.

Liquid and semi-liquid toxicants are usually sprayed onto the carriers while they are agitated. For very small 50-100 gram samples, we use a spray apparatus made from a half-gallon Mason jar with two holes drilled in the bottom and a modified "Osterizer" agitator. A special DeVilbiss 5001 spray nozzle, heated by a resistance wire, air atomizes the pre-weighed toxicant. The air is vented by an extraction-thimble vent or baghouse. See Figure 1. For larger samples, we use a one-gallon ribbon blender with variable speed drive and a pressure spray-pot. The pressurized pot may be heated by an electric mantle. A solenoid valve allows rapid shut-off to increase the accuracy of controlling the weight of the material sprayed. See Figure 2.

Solid toxicants are usually ground with the carrier by low energy hammer milling. If a finer particle size range is required, the sample may then have to be air jet milled. During this preparation, rather empirical observations are made as to how well the sample handled during processing. An attempt is made to evaluate relative flowability and grindability.

The proportions of toxicant, carrier, and diluents used are chosen by a combination of trial and error and previous experience with toxicants of similar physical characteristics. If the toxicant is a low-viscosity liquid at room temperature, a higher percentage of absorptive carrier is needed than is required if the toxicant is a solid.

Experience has shown that the following "rule-of-thumb" generally correlates the sorptivity of the carriers with the set-point or melting point range of the toxicant, assuming the desired product is dry and flowable. The correlation is not precise, because of the broad melting point range of impure toxicants, and the empirical method of evaluating flowable powders. The sorptivity per unit of toxicant is calculated by summing the products of per cent carrier and the Gardner-Coleman water absorption[7] for the carrier and dividing this sum by the per cent toxicant. Table I shows the range of sorptivities needed for several melting point ranges.

dilute the formulation to the desired toxicity.

Although previous experience sometimes aids in the selection of wetting and dispersing agents, each toxicant-carrier system seems to be an individual case. The selection must attempt to account for the cost of the ingredient and the necessary percentage addition. The surfactants vary in their active concentration, as well as cost, so that a more expensive compound used at a lower concentration may be equal to a cheaper ingredient that must be used at higher concentrations. The physical form of the surface-active agents also affects their selection. Powdered products may be readily blended into a formulation, even at small additions. Liquid and waxy products are harder to add, particularly where uniform distribution of a small percentage is required. However, if the toxicant is to be spray impregnated onto the carrier, and if the surfactant is miscible with the toxicant, they may be mixed and sprayed at one time.

Table I: Sorptivities for Flowable Concentrates

Melting Point Range		*Unit Sorptivity*
Liquids	$< 75°F$	> 275
Semi-solids	$75°F$ to $200°F$	275 to 135
Solids	$> 200°F$	< 150

$$\text{Unit Sorptivity} = \frac{\Sigma\ (\%\ \text{Carrier})\ (\%\ \text{Water Absorption})}{(\%\ \text{Toxicant})}$$

4. Surfactants and Other Additives:

The fourth step in developing a formulation is to determine suitable surfactants and other additives. Evaluation of surface-active agents normally starts with trial and error "compatibility" tests with a "blank" toxicant-carrier formulation. This "blank" is prepared in step 3, by impregnation, hammer milling, and/or air jet milling. A "blank" sample is one that does not contain any surfactants when prepared. The concentration is purposely slightly higher than is ultimately desired, so that the addition of several per cent wetting and dispersing agents will

It is impossible to test all the possible combinations of wetting and dispersing agents at their optimum concentration, and at all the possible conditions of water hardness and temperatures. Surfactants are therefore tested for compatibility at an arbitrarily selected concentration (2 to 5 per cent), water temperature (78°F), and water hardness (342 ppm). Individual samples of the toxicant-carrier "blank" plus wetting and dispersing agents are hand mixed and slurried in the test water. These samples are visually evaluated for wetting time, amount and

(*Continued on Page* 103)

FERTILIZER CONDITIONING

*Physical Condition of Mixed Fertilizers,—and the influence of ammoniating solutions.**

by John O. Hardesty

Fertilizer Investigations Research Branch
Soil and Water Conservation Research Division
Agricultural Research Service
U. S. Department of Agriculture
Beltsville, Maryland

THE purpose of the present discussion is to review briefly some significant data pertaining to the causes and alleviation of poor physical condition in mixed fertilizers and to consider certain effects of present-day ammoniating solutions on the physical condition of mixtures.

Hygroscopicity

There are two avenues which lead to poor physical condition in mixed fertilizers. One allows entry of sufficient moisture from the atmosphere to make mixtures damp and sticky, and the other allows caking of the bagged product. Moisture absorption is caused by the presence of excessive proportions of hygroscopic salts, or mixtures of such salts, in the fertilizer. Remedies for this type of poor physical condition include (a) formulation with low proportions of hygroscopic salts, (b) storage in air-conditioned buildings, and (c) packaging the dried product in high-grade, moisture-resistant bags. The subject of hygroscopicity of fertilizers is well-covered in the technical literature (*2, 3, 7, 8, 9*), and appears to need no further elaboration here.

Caking

Caking of mixed fertilizers is of great concern to the manufacturer and the consumer because of its adverse effect on drillability of the product. Caking is the result of crystallization of salts from solution at the surface of particles (*8, 10, 11*) which tends to cement, or knit, the particles of the mixture together. The degree of crystallization within the mixture is affected by moisture content (*6*), proportion of soluble salts in solution (*7, 10*), chemical reaction (*11, 13*), temperature (*13*), the number of contacts between particles per unit mass of the mixture as related to particle size and shape, and the mechanical pressure on the product such as that produced in the bottom bags of a high bag-storage pile.

Conditioning Agents

Conditioning agents are of practical value only when they eliminate caking (*6*). Consumer demand is for completely free-flowing products. Mixtures with a moderate caking tendency yield to conditioning agents (*4, 6*); those with a severe caking tendency do not. Control of the above-mentioned factors which cause caking (*13*) usually eliminates the need for conditioning agents.

Liquid Phase

Interactions and mutual solubilities of salts in a mixed fertilizer sometimes make practical methods of control a complex technical problem. Let us consider an example of the effect of mutual solubilities of ammonium nitrate and urea on the liquid phase imparted to mixed fertilizers by ammoniating solutions. Table I shows the relative volumes of aqueous solutions saturated with ammonium nitrate and urea in varying proportions at 86° F. (*5*). Total salt in solution and the relative volume of solution per unit volume of water increase with increase in the proportion of urea present up to the eutectic point of about 46% urea in this salt mixture, and then decrease on further increase of the proportion of urea present. At the eutectic point, one gallon of water dissolves 131 pounds of salt mixture (60 lbs. urea and 71 lbs. NH_4NO_3) at 86° F. to produce 12 gallons of liquid phase. Data from this table are used in Table II to show the proportion of liquid phase imparted to a mixed fertilizer per unit of nitrogen supplied by four different ammoniating solutions. Two of the ammoniating solutions are ammonia-ammonium nitrate solutions, 414 (17-74-0) and 530 (49-36-0), selected on the basis of the maximum and minimum contents of ammonium nitrate usually present in this type of solution. The other two are ammonia-ammonium nitrate-urea solutions, 430 (20-68-6) and 440 (28-40-15), representing the maximum and minimum contents of urea, usually present in this type of solution (*1, 12*).

The first five items in Table II may be found in, or easily cal-

*Presented at the Fertilizer Industry Round Table, Washington, D. C., November, 1959.

$CuSO_4$

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culated from, the data usually supplied by manufacturers of ammoniating solutions. In item 6, use is made of the data given in Table I showing the relative volumes of aqueous solutions saturated with urea and (or) ammonium nitrate in varying proportions at 30° C. (86° F.). For example, from the data in Table I, it may be observed that 242 pounds of ammonium nitrate will be dissolved by 100 pounds of water to form a saturated solution at 86° F., thus 36 pounds of ammonium nitrate (Item 5) incorporated in a fertilizer mixture by introducing one unit of nitrogen from Solution 414 (17-74-0) will dissolve in 15 pounds of water (Item 6), or 1.78 gallons (Item 7) to form 51 pounds of a saturated liquid phase (Item 8), weighing 11.3 pounds per gallon, or 4.5 gallons of liquid phase (Item 9) in the fertilizer. Likewise the solubility data in Table I show, by interpolation, that 492 pounds of a salt mixture having a urea/ammonium nitrate ratio of 27/73, such as that in Solution 440 (28-40-15), will dissolve in 100 pounds of water. Thus, 25 pounds of this salt mixture incorporated in the fertilizer by introducing one unit of nitrogen from Solution 440 (28-40-15) (Item 5) will dissolve in 5 pounds of water (Item 6) or 0.61 gallon (Item 7) to form 30 pounds of a saturated liquid phase (Item 8) weighing 11.3 pounds per gallon, or 2.7 gallons of liquid phase (Item 9). Dividing Item 9 by Item 7 gives the relative volume of liquid phase present in the mixture per unit volume of water present.

Table II shows that ammonia-ammonium nitrate-urea solutions provide from 12 to 80% more liquid phase for equal amounts of nitrogen than the ammonia-ammonium nitrate solutions. It is not surprising that some products formulated with Solution 440 (28-40-15) have undesirable properties as compared with those formulated with the other three solutions shown in Table II. Such products may be wet and sticky on emergence from processing. They may be difficult to dry artificially and they may not become dry and friable during the curing stage. Data on the relative volume of liquid phase imparted to mixed fertilizer by the salt content of ammoniating solutions would seem to be a useful addition to the instructions to plant operators on formulating with solutions.★★

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Table I. Relative Volumes of Aqueous Solutions Saturated with Urea and Ammonium Nitrate in Varying Proportions at 30° C. (86° F.)

Component	Proportion of Dissolved Salt										
Urea	0	10	20	30	40	46	50	60	70	80	100
Ammonium Nitrate	100	90	80	70	60	54	50	40	30	20	0
	Pounds per 100 pounds of water										
$CO(NH_2)_2$	0	29	74	164	375	719	482	266	204	172	133
NH_4NO_3	242	259	294	381	562	845	482	178	87	43	0
Total salt	242	288	368	545	937	1564	964	444	291	215	133
	Relative vol. of solution per unit vol. of water										
Solution volume	2.5	2.9	3.5	4.7	7.6	12.1	7.9	4.2	3.1	2.6	2.0

Table II. Liquid Phase Imparted to Mixed Fertilizer by Ammoniating Solutions

No.	Item Description	Ammonia-Ammonium Nitrate Solution No.		Ammonia-Ammonium Nitrate-Urea Solution No.	
		414	530	430	440
1	NH_3-NH_4NO_3-Urea, %	19-74-0	19-36-0	20-68-6	28-40-15
2	Nitrogen content, %	41.4	53.0	43.0	44.0
3	Ratio urea/NH_4NO_3, %	0/100	0/100	8/92	27/73
4	Total salt content, %	74	36	74	55
5	Salt content/unit N, lbs.	36	14	34	25
6	Water content of mixture required to form a saturated soln. at 86° F., lbs./unit N	15	6	12	5
7	gals./unit N[1]	1.78	0.67	1.48	0.61
8	Total wt. of liquid phase, lbs./unit N	51	20	46	30
9	Volume of liquid phase, gal.[2]/unit N	4.5	1.7	4.1	2.7
10	Gal. liquid phase/gal. water[3]	2.5	2.5	2.8	4.5

[1] Water, 8.35 lbs./gallon.
[2] Liquid phase, 11.3 lbs./gallon.
[3] 1 gallon water equiv. to 0.417% in mixed fertilizer.

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Commercial Fertilizer Conditioners

Compiled below is a review of commercial fertilizer conditioners, a discussion of their properties, rates of use and chemical nature. The data was supplied by the respective manufacturers.

Vermiculite as a Conditioner

A high absorption and low density mineral, Vermiculite has been used as a fertilizer conditioner for some 11 years. It is offered by Zonolite Co., Chicago.

Vermiculite grades offered as fertilizer conditioners contain less than one per cent moisture, are non-hygroscopic, and neutral (pH of 6.7 to 7.4). The density ranges from 7 to 12 pounds per cubic foot. One grade contains 13 million particles per pound, another grade contains 27 million particles per pound.

Other vermiculite grades are offered as carriers for agricultural chemicals.

Petro Ag, A Soluble, Organic

Petro Ag and Petro Ag Special are two water soluble anti-caking agents offered by Petrochemicals Co., Long Beach, Calif. The products are organic in composition, available as liquid or powders, and suggested for use with ammonium nitrate, ammonium sullfate, sulphur, urea, phosphates, dry blended fertilizers and insecticide dusts.

The manufacturer reports that ½ to 1 pound of Petro Ag per ton of fertilizer eliminates caking or hardening in most cases. The product is available as a 98% powder and as a 50% liquid.

Petro Ag Special, when used at ½ lb. to 1 lb. per ton of granulated mixed fertilizer is reported to improve the spherical nature of the fertilizer, making it more "prill-like", and to increase the density of the final product 5 to 7%. For anti-caking and no effect on granulation, the manufacturer suggests dry blending, using 1 to 2 lbs. conditioner per ton.

•

Doloxide, A Mg-Ca Oxide

Pulverized magnesium calcium oxide is offered by Moores Lime Co., Springfield, Ohio, for "fast curing" of fertilizer, and for use as an alkalizer to reduce acidity of fertilizer mixes. Doloxide has a pH of 10.

In nitrogen grades, the manufacturer suggests adding 10 lbs of Doloxide per ton of fertilizer. In no-nitrogen grades, 25 lbs per ton is suggested for a 0-10-10, 30 lbs for a 0-14-14 and 35 lbs for 0-20-20. Best results, they report.

A screen analysis shows 99% passing the 100 mesh, and 91% passing 200 mesh. A chemical analysis is reported as follows:

SiO_2	0.85%
Fe_2O_3	0.34
Al_2O_3	0.29
MgO	40.02
CaO	57.62
Loss on ignition	0.80

Celite, a Diatomaceous Silica

Celite is Johns-Manville's registered trade mark for the diatomite it mines and processes for use in the fertilizer and pesticide, as well as other industries. As a fertilizer conditioner, the product provides a uniform coating that prevents caking, and maintains good free flow characteristics. It is stable with granular, mixed and prilled fertilizers, and is used with ammonium sulfate, ammonium nitrate, urea and mixed fertilizer.

Properties making it useful as a conditioner for fertilizers include the following:

1) low loose weight density
2) high absorptive capacity
3) high available surface area
4) uniform, microscopic particle size distribution
5) chemically pure and inert

Johns-Manville, New York, offers its Celite mineral fillers in several grades, including uncalcined, calcined and flux-calcined powders. Color, absorption, density and screen analysis are controlled within grades, so that specifications can be met, regardless of industrial application. A typical chemical analysis (moisture free basis) is as follows:

Composition	*Per Cent by Weight*
Loss on Ignition	3.0
SiO_2	89.2
Al_2O_3	4.1
Fe_2O_3	1.5
TiO_2	0.2
CaO	0.5
MgO	0.5
Na_2O	0.5
K_2O	0.5

•

Aquafil, A Diatomite

A natural diatomite product, prepared by Aquafil Co., Los Altos, California, is sold under the tradename "Aquafil" as an anti-caking agent for complex fertilizers and as a dust carrier in insecticide formulation. The manufacturer suggests a ratio of 2 to 3½% for coating ammonium nitrate.

Specifications for two grades of Aquafil are as follows:

	K-8	N-81
Color—GE Brightness %	76	68
Moisture, max. %	6.0	3.0
Ignition loss, Dry basis, %	6.0	5.1
Silica, %	86.5	82.2
Bulk Density lbs/cu. ft. (ScottVol)	9.5	5.8
Wet Density (Centrifuge)	19.5	16.4
pH	7.2	5.8
Refractive Index	1.585	1.580
Surface area sq./M/grm	46	68
Gardner-Coleman Oil Absorption	140-160	150-180
Specific Gravity (Pycnometer)	1.86	2.08
Min. % thru 325 Mesh (wet)	98	94
Min % thru 200 Mesh (wet)	99	99

Celatom, Diatomaceous Product

A diatomaceous earth mined in Clark, Nev., is offered by Eagle-Picher Co., Cincinnati, O., under the tradename "Celatom", as an anti-caking agent for fertilizer, as an insecticide carrier, and herbicide absorbent.

The mineralogical analysis shows the product to consist of fresh water diatomites,—predominantly diatomaceous silica.

Kenite Anticaking Agents

Kenite Corporation, Scarsdale, N.Y., offers two grades of a diatomaceous silica as conditioning agents for fertilizer. "Kenite AC" is suggested for conditioning ammonium nitrate, and "Kenite 51" for high-analysis granular fertilizers and other mixed fertilizers.

The structure of the product is typically diatomitic,—the predominant diatoms present are disc, elongated and spicules. Bulking value and conditioning power are defined by the 30 to 35 diatoms in a cubic inch. Specifications show that pH of both the "51" and "AC" products is no greater than 7, average particle size is 2-4 microns, maximum wet density is 20 lbs, and average surface area is 37,000 cm^2/gm. Moisture of Kenite AC is 4% maximum, compared with 6% maximum for Kenite 51. Respective bulk densities are 10 lbs./cu. ft. maximum and 8 lbs./cu. ft. maximum.

Attacote, An Attapulgus Clay

Attacote is a fine particle size, sorptive Attapulgus clay product produced by Minerals & Chemical Corp., Menlo Park, N. J. as a coating agent for ammonium nitrate and other fertilizers to prevent caking. It is uniform in quality, inert, non-toxic, and adheres to granular chemicals when applied as a coating agent by simple tumbling.

Minerals and Chemicals advise that one half of one per cent eliminates caking, also that sorptive properties make it an effective buffering agent for traces of unwanted acidity or alkalinity.

Typical properties are listed below:

Average particle size (Microns)	8
Ultimate particle shape	Needle-like
Oil absorption ASTM D-281-31)	79.8
Free moisture, 220°F (as produced) wt. %	2.0
Ignition loss, 1800°F (as produced) wt. %	7.0
pH	8.5
Color	Cream
Specific gravity	2.47
Residue 325 mesh (wet) wt. %	1.50
Bulk density (packaged condition) lb/cu ft	16
Surface area, sq meters/gm	125

•

Fur-Ag, Organic Conditioner

Fur-Ag is a dark brown pulverized material obtained in the processing of agricultural residues, such as corn cobs and oat hulls to make furfural. The raw material is cooked under pressure with dilute acids, while passing steam through the cooker. The Fur-Ag thus prepared consists principally of modified cellulose, lignin, ash and a small amount of sulfuric acid. The product is made by Quaker Oats Co. in plants in Memphis, Tenn. and Cedar Rapids, Ia. It is pulverized material, which flows easily and is not unlike ground coffee in general appearance and texture.

When used as a conditioner in mixed fertilizers, the manufacturer indicates that the time of curing may be reduced from a matter of weeks to a few days. They suggest about 100 pounds per ton of fertilizer to reduce caking, and report Fur-Ag can be used as an ammonia fixative, since it contains 2 to 3% sulfuric acid. The product also contains small amounts of plant food elements, which can be figured into formulas, — .4% nitrogen and 1.0% potash.

Manufacturers of Fertilizer Conditioners

Aquafil Co.
321 State Street
Los Altos, Calif.

Eagle-Picher
American Building
Cincinnati 1, Ohio

Johns-Manville
Box 14
New York 16, N. Y.

Kenite Corp.
Scarsdale, New York

Minerals & Chemicals Corp. of America
27 Essex Turnpike
Menlo Park, N. J.

Moores Lime Co.
Springfield, Ohio

Petrochemicals Co.
Long Beach, Calif.

Quaker Oats Co.
341 Merchandise Mart Plaza
Chicago 54 ,Ill.

Zonolite Co.
135 S. LaSalle St.
Chicago 3, Ill.

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If you're going to use chemicals, Oldbury sodium chlorate is still the most dependable way to kill weeds.

It kills them all.

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Open-head drum empties faster. Oldbury sodium chlorate comes in a fast-opening drum. A single lever seals and reseals the drum with a metal band. Full open head makes pouring, scooping, or shoveling easy.

Available in 50-, 100- and 450-lb. sizes.

Technical aid. Full-time Hooker agronomists can help with weed control plans and advise on handling, storing, and using sodium chlorate.

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Sales offices: Buffalo, Chicago, Detroit, Los Angeles, New York, Niagara Falls, Philadelphia, Tacoma, Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B.C.

Production Roundtable

Roger C. Smith

Mr. Smith is head of Fertilizer Research for Eastern States Farmers Exchange

The Challenge of New Grades

THE challenge of new grade requests, how best to make such grades and how much to have in inventory is constantly confronting the plant manager. How this challenge is met has much to do with plant storage capacity, rate of shipping and overall per ton cost of production.

This is by no means new to the plant manager. Sales departments have been continually relaying requests for new grades — some of which have appeared to be maverick ones. These grades have included some based on sound reasoning, some recalled from the distant past and some unexplainable. Over the years there has been a ground swell of increasing agronomic information which has substantiated basic grade changes. Intermittent between these ground swells have been the ripples of grade requests which have appeared to serve some expediency instead of real progress. In these instances, a legitimate complaint of the plant manager has been that it is easy to add a grade, but difficult to discontinue one.

The problem is now increased by certain current developments. One is the greatly expanded soil testing services, which not only add to the general fund of agronomic information, but also isolate local fertility levels, calling for plant food ratios other than those normally made in a given fertilizer factory or perhaps even common to a given state or region. This is intensified by a proneness of those making soil test recommendations to avoid constant repetition, and to prescribe differences in recommendations, perhaps beyond the sensitivity of the soil test methods.

Another development which can affect the choice of grades is a trend toward higher rates of application or changes in crop rotations. An example of the effect of application rate on plant nutrient ratio needed is the current development in grass fertilization. Phosphorus was used alone in most areas as the initial grass fertilizer, some of which was financially encouraged by the federal government. The use of potash followed and then nitrogen. Recent agronomic research has demonstrated a marked response to higher levels of fertilization. Also, ratios higher in nitrogen than available phosphoric acid and potash are demonstrated to be most profitable. We have observed in recent years the 10-10-10 and other 1-1-1 ratio grades to increase rapidly in tonnage. Now there is demand for higher nitrogen ratios such as 3-2-2, 4-2-2 or 4-2-3.

Producing an Inverse Ratio Grade

The question rises, "How do I produce a grade having an inverse ratio in my plant?" The answer lies in the full application of the principles of ammoniation and manufacture. The allotment of as much time as possible for ammoniation of superphosphate, the use of superphosphate of fine particle size and having other good ammoniation characteristics, and the use of a low ammonia content solution are important. Salt solubility must be considered. Sulfate of ammonia is very generally used as the source of the additional nitrogen, because of its relatively low solubility among nitrogen salts and its being reasonably low priced. Some means of conditioning is usually necessary. Again, reference to basic principles of fertilizer manufacture is in order. Drying to a moisture content of about 1% reduces markedly the amount of salts in solution. Reducing the surface contact of the particles minimizes the amount of crystal knitting under pressure and during slight change of temperature and moisture in storage. Granulation is the most effective way to reduce surface area, especially with classification to a narrow range of particle size.

Pre-neutralization appears to be an effective way to increase nitrogen content of a grade irrespective of phosphate level. Many granulation plants have or are installing these units, which enable the reaction of additional ammonia in nitrogen solution with sulfuric acid and/or phosphoric acid, the dissipation of heat through water evaporation and discharge of the product into the mixer.

Demonstrating by agronomic research the profitability and other benefits of using larger amounts of nitrogen than phosphorus and potash has led to more intensive application of the principle of ammoniation and other formulation techniques. The fact that the need is being met adequately is an

(*Continued on Page* 105)

WASHINGTON REPORT

By Donald Lerch

THOUGH it has not been widely reported, Congress is more keenly aware of the real issues underlying the "cranberry conflict" between USDA and FDA than is generally supposed.

Representative Jamie Whitten, of Mississippi, commented during a recent hearing before the House Appropriations Sub-committee on Agriculture that as matters stand HEW "Apparently has the determination of whether half the American farmers are going bankrupt in a given year . . . and . . . They do not have to issue an order, merely a press release. As long as that situation prevails, they have control over what can be marketed."

Whitten then put his finger on a real point of difference between HEW and USDA. He pointed out that both Departments using the same research findings can come up with different opinions since USDA holds that trained scientific professional judgment should be exercised before decisions under authority of the law are made, while HEW holds that they have no authority to use judgment.

One might conclude, as some in and out of Congress have, that this HEW approach has some drawbacks. So far as some chemicals are concerned it has appeared to mean that by following the letter of the law, the spirit and purpose of the law has been sacrificed, and many innocent farmers have been damaged.

The final outcome of HEW's press releases on cranberries and on poultry is just starting to be tallied up in cost to the taxpayers. The Federal Government is paying $10 million in indemnity to cranberry growers, and has agreed to buy $500,000 worth of treated poultry. In addition, the Federal government is buying cranberries for government use and is seeking authority to can "untainted" light and dark meat from poultry that had been fed stilbestrol and offer it to states for welfare distribution.

It's now generally conceded here that in neither the cranberry nor the poultry case was any real hazard to public health involved. As Congressman Whitten commented, "As it appears now an administrator can be very capricious." And, we might add, at a high cost to the already overburdened taxpayer.

* * * * * *

Pesticide and fertilizer manufacturers may soon come under pressure from the U. S. Commerce Department to export more pesticides and fertilizers.

Commerce Secretary Frederick H. Mueller told us at a small meeting here that he wants all U. S. firms to sell more overseas; in his words, "to make more money and create more jobs by selling more abroad."

Mueller said a special promotion is underway right now to alert smaller U. S. firms to the big potential of overseas markets. While he did not mention it, the growing world interest in a crusade against hunger and disease sets a perfect background for increased sales of both pesticides and fertilizers in foreign markets.

The UN's Food and Agriculture Organization for years has been telling people in underdeveloped countries that these two categories of products can give them faster increases in food crop yields than almost anything else they can do. An organized crusade program, now being shaped up by FAO and others, will put new spirit into this overseas promotion.

What Mr. Mueller did say, however, was that price is not the only sales factor abroad. Other peoples appear willing to pay a premium for high quality American products when they are tailored to meet foreign conditions and when firms can offer service with them.

U. S. export totals already seem to be responding to Mr. Mueller's imaginative export promotion program. Total U. S. exports last year were about $16.5 billion. During the first quarter of 1960 exports were running at the annual rate of $18.5 billion.

A few leaders in the pesticide and fertilizer industries, at least, appear to be gearing up to take advantage of these expanding overseas markets. If Commerce Secretary Mueller's export promotion really gets underway, the estimate is that many more will up their own overseas promotion and export activities.

* * * * * *

The chance that Congressman Leonard G. Wolf's "Chemical Pesticides Coordination Act" will pass this session of Congress is slim. NAC is opposing the measure which would require federal agencies to consult with the U. S.

Fish and Wildlife Service and state wildlife agencies before starting any pesticide control program.

NAC's position on the bill is that a committee already has been set up to coordinate the activities of wildlife and agriculture interests in regard to pest control programs, and that the National Academy of Sciences now is forming a committee to study the entire problem.

USDA and the U. S. Public Health Service, the two federal agencies which carry out pest control programs, also opposed the bill, while the U. S. Fish and Wildlife Service proposed an amendment to the Pesticide Research Act of 1958 in place of Wolf's measure.

This leaves only the International Association of Game, Fish and Conservation Commissioners, the Southeastern Association of Game and Fish Commissioners, and several private organizations, including the National Wildlife Federation, supporting the bill.

Although the Wolf bill is not likely to pass Congress in 1960, it cannot be dismissed too lightly. Its introduction reflects the continuing pressure of some state and private wildlife interests against pest control programs. These people, we might add, are highly adept at both publicity and promoting favored legislation.

The imported fire ant eradication program, incidentally, a favorite target of some wildlife groups, appears to be continuing. USDA reports that imported fire ants have been cleared out of 75 counties in the South. And the program is being extended for the first time to cover six new counties and parts of 19 other counties and parishes in Alabama, Georgia, Louisiana, and Mississippi.

Our own checking with publishers of county newspapers in Alabama, the state which refused to provide state matching funds for the fire ant eradication program, indicates that many Alabama people want the fire ant eradicated as fast as possible.

A ray of light is beginning to shine through the black cloud of adverse publicity so far as pesticides are concerned. This is the growing view of manufacturers who have been becoming increasingly concerned over the effect of anti-pesticide attacks on current and future business.

Appearance of favorable, or at least objective, articles in a few leading magazines is being accompanied by editorials urging common sense about pesticides in a number of influential newspapers. Public opinion, as we all know, flows in waves. Some optimists in the industry feel that the tide of public opinion, which has flowed against the industry's products for so long, may now be starting to run in their favor. Nevertheless, there still is far more unfavorable than favorable publicity for pesticides, and the attacks on the industry products and their use in the various control programs continue (see page 86).

The National Agricultural Chemicals Association continues its attempt to set the record straight, and has just issued a new publication, "Pesticides and Public Policy." This work traces public involvement in investigating and regulating pesticides since 1900 and throws the entire issue into a new light.

While not included in the booklet, the material supports the conclusion of Dr. T. C. Byerly, Deputy Administrator of USDA's Agricultural Research Service, that "The record of safety in use of agricultural chemicals . . . is amazingly good. I know of no proven case of injury to human health from use of such chemicals according to procedures permitted by the Department of Agriculture and the Department of Health, Education, and Welfare."

* * * * * *

You can expect to hear a lot more about soybeans in the near future. Some people are predicting a boom in soybean acreage and a considerable increase in the sale of soybeans, soybean oil, and soybean products.

In the wake of this trend, leaders in the fertilizer and soybean industries are promoting efforts to speed up soybean nutrition research. Ward J. Calland, head of the Soybean Crop Improvement Association, already has asked Congress for $280,000 in federal funds for this purpose.

Further, a committee has been set up in the mid-west to speed soybean research, and the National Plant Food Institute, as well, is seriously interested in promoting soybean nutrition research. Looking toward the day when soybeans —one of nature's most versatile crops — may become one of our biggest crops, the mood here today is "progress has got to be made".

This trend to soybeans suggests certain marketing opportunities for pesticide makers who can do research on better pest and weed control in soybeans. This may or may not be the crop of the future, but one indication is USDA's work to allow processing of soybeans to make foods acceptable to Asia's booming millions of people.

* * * * * *

Three realistic themes will dominate the National Plant Food Institute's annual meeting at the Greenbrier June 13-15: expansion of NPFI's already successful soil fertility education programs; increasing dealers' sales of fertilizers; and the political responsibilities of the business community.

NPFI now has about 150 so-called "bellweather" soil fertility projects going and is seeking to enthuse the Extension Service in carrying the idea of the project to every county in the nation. Wherever Extension people do start up projects, NPFI will be ready to assist with a "know-how package" and results of their own successful experience covering several years.

While not limited to fertilizers, many in the fertilizer industry are taking an interest in their

(Continued on Page 118)

Offering a new Insecticide

Butonate

LOW IN TOXICITY • ECONOMICAL

Now available in commercial quantities: a new insecticide called *butonate.** Developed at the University of Wisconsin, it is unique among insect killers in having all of the following properties:

- *Residual action against insects even in light concentrations*
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Butonate is a cholinesterase inhibitor. Laboratory tests have proven its effectiveness against household and certain agricultural pests. It may be formulated as an oil spray, an emulsion, wettable powder, or dust.

One formulation, Prentox Pybuton Concentrate, contains 16% by weight butonate, 1.0% piperonyl butoxide and 0.4% pyrethins, combining the residual action of butonate with fast knock-down action while maintaining low toxicity. Butonate is also available as a 25% emulsifiable concentrate, as a 20% oil soluble concentrate, and in a technical formulation containing 95% by weight butonate.

Chemically, butonate is an organic phosphate—0, 0-dimethyl 2, 2, 2-Trichloro-1-n-butyryloxyethyl phosphonate. It is a colorless, somewhat oily liquid, stable in neutral or acidic aqueous solutions, having a (mild) ester odor. Additional information, test data and samples for testing may be secured from us at any of the addresses shown below.

**Butonate's manufacture is licensed by the Wisconsin Alumni Research Foundation under U. S. Patent No. 2927881.*

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The AGRICULTURAL Applicator

- Aircraft In Disease Control
- Wage-Hour Regulations
- Problems of Aerial Applicators
- Applying Granules
- Florida Law Discussed

The expected increase in the use of granular herbicides this season will mean that applicators must, in many cases, adapt their existing equipment to do the job. Article on page 66 discusses the kinds of equipment that can be used to apply granules and what is available this year.

AIRCRAFT IN PLANT DISEASE CONTROL

In addition to pest control and fertilizer applications, airplanes and helicopters are being utilized to an increasing extent in the control of plant diseases both in the United States and abroad. Some crop disease control programs for which aerial application has been employed and shows promise include: late blight of potato and tomato, brown rot of stone fruits, pecan scab, fire blight of pecan trees, cranberry rots, snow mold of winter wheat, oak wilt, and Dutch elm disease.

by Paul R. Miller and Jessie I. Wood
Crops Research Division, USDA, Beltsville, Md.

READERS of *Agricultural Chemicals* are of course familiar with aerial application of chemicals, but they may not be so well acquainted with other purposes for which plant pathologists use aircraft. One is aerobiological research, — another is aerial surveying. Both add to the fundamental knowledge on which the success of control measures ultimately depends.

Some 40 years ago E. C. Stakman and his co-workers at the University of Minnesota used airplanes in some preliminary investigations of the altitudes reached by spores of cereal rusts and other plant pathogenic fungi, and by pollen grains also, and the direction in which these particles were carried by air (25). The real pioneer in the use of aircraft for systematic aerobiological research, however, was Fred C. Meier, of the United States Department of Agriculture. It was he, according to Haskell and Barss (7), who gave the name "aerobiology" to the phase of biology concerned with the origin, kinds, abundance, vertical and horizontal direction and speed of drift, and ultimate fate of the "biological particles" contained in the atmosphere. The famous aviator Charles A. Lindbergh became interested in the problem and helped Meier in many ways, not only by sometimes piloting him, but also by designing apparatus for collecting microscopic organisms from the air during flights (18). Lindbergh himself used this "sky-hook" to make collections from Arctic air during his flight across the northern Atlantic Ocean in 1933 (18).

In 1938, the United States Department of Agriculture and the National Research Council in cooperation set up a research project on aerobiology. In July of that year, Meier and a medical colleague, Dr. Earl B. McKinley, Dean of the School of Medicine of George Washington University, were en route from San Francisco to Manila, to begin work in the Pacific region, when the Pan American Clipper in which they were travelling disappeared without a trace (7).

Collection of samples from aircraft, although it constitutes only one method used in aerobiological investigations, provides information on long-distance dissemination of plant pathogens that cannot be obtained by other means. Canadian pathologists, who seem to have been most active in this field in recent years, found that certain spores survived their "flight" across the north Atlantic in viable condition (20). Such studies are fundamental to the understanding of some epidemiological problems.

Aerobiological surveys with aircraft could be considered a special type of aerial plant disease survey, with the difference that the data sought concern the pathogen, whereas aerial surveys, more strictly defined, are planned to locate diseased plants by symptoms that are conspicuous from the air. Aerial scouting has been particularly useful in determining the distribution of some rapidly spreading tree diseases; for example, oak wilt (*Ceratocystis fagacearum*) and the Dutch elm disease (*Ceratocystis ulmi*) (4, 5).

With the aid of photography, aerial surveys can become very precise. Colwell (1) applied photo-interpretation techniques to wide-scale surveying for diseases of cereals. Using infra-red color film, he was able to differentiate healthy from diseased plantings; to detect very small isolated infection foci of stem rust (*Puccinia graminis*) in wheat and oat fields or yellow dwarf (a virus disease) spots in oat fields; and to estimate accurately the severity of disease in infected fields. Ability to detect very early infection centers of rust is especial-

ly important, since it has a definite bearing on the successful use of chemical control measures against rust. West (28) used additional photographic techniques to reveal nutritional deficiencies as well as diseases of plants caused by pathogens. In the event that biological warfare through plant pathogens is ever used against our crops, early detection of infection and speedy application of fungicides by aircraft would constitute one of our principal defensive weapons.

As readers of this journal are well aware, aircraft, both airplanes and helicopters, are being increasingly employed in the control of plant diseases. The technical problems involved are the subject of continuous investigation, but they have been solved well enough so that Maan (17), in the Netherlands, could say in 1954 that nearly all important diseases could be effectively controlled by aerial application of chemicals. The technical aspects are outside the scope of this article, which aims only to give some indication of the extent of use of aircraft for this purpose, and of the kinds of diseases for which aerial application is considered to be economically practical, as gleaned from recent publications. No attempt has been made at a complete review.

In Pakistan, airplanes have proved so effective as well as so economical to use in comparison with ground equipment, that since 1951 the Department of Plant Protection has maintained a small aerial unit, according to Hafiz (6). At first, this unit was used to combat the locust, but more recently large scale campaigns against other insects as well as wheat rust have been successful. Hafiz remarked further that the farmers of Pakistan are very much aware of the advantages of pest and disease control. So many small farmers who do not possess the means to conduct control operations themselves request help that the Department of Agriculture is unable to meet all the demands in time. The remedy for this situation, Hafiz suggested, is for each Province to establish its own aerial plant protection wing. Inclusion of both airplanes and helicopters would render the service adaptable to different types of plantings and terrain, while for East Pakistan, where large areas are under water, amphibian planes would be most useful. For such a service to produce maximum benefits, careful programming would be required to keep each machine in constant use throughout the year. Whether or not such an extensive system could actually be installed, the suggestion in itself is a measure of the contribution of the airplane to Pakistan's agricultural economy.

USDA photo shows an airplane spraying cotton near Lubbock, Texas. Nearly all important plant diseases could be controlled by aerial application of chemicals. In addition, aerial surveys aid in detection of infected fields.

This Pakistan report illustrates a difficulty in determining from the literature exactly the extent to which aircraft actually are used for plant disease control, and the diseases that are combatted in this manner. Although Hafiz (6) included disease control among the achievements of aerial application of chemicals, he does not mention any specific disease other than wheat rust. Many other reports are similarly vague as to diseases, whereas they specify particular kinds of insects or weeds. Does this mean that ground machinery is more efficient, — and that aircraft are not fully accepted for disease control, or that it is more difficult to adapt aircraft to the application of fungicides than of insecticides? It is evident that aircraft are being used much more to control insects and weeds or to apply defoliants than to control diseases (see Table 1). For instance, in California in 1953, of 3,525,533 acres treated by aircraft, only 211,878 were treated for disease control (15).

(*Continued on Page* 113)

Table 1.—Aerial Application of Pesticides and Defoliants in the U. S. in 1957

Activity	Area Treated	Materials Dispersed	
		Dry	Liquid
	1,000 acres	1,000 lb.	1,000 gal.
Insect control, total	46,157	215,269	64,618
Crops, orchards, etc.	30,472	213,902	51,946
Forests	10,338	151	7,698
Towns	2,695	517	2,251
Soils	2,652	699	2,723
Plant disease control	1,048	13,725	3,103
Weed control	6,904	12	12,112
Brush control	585	172	2,294
Defoliation	2,094	12,968	11,415
Total	56,788	242,146	93,542

Source: CAA Statistical Handbook of Civil Aviation, 1958, edition.

Field Supervisor Discusses Some Interpretations of Wage-Hour Regulations Pertaining to Applicators

DONALD D. Drew, field office supervisor of the Wage and Hour Division, U. S. Department of Labor, discussed the application and requirements of the Federal Wage-Hour Law as it applies to the aerial application industry with John F. Neace, chairman of the Arizona Aerial Applicators Association.

Mr. Drew said that a question has arisen relative to complete exemption from wage-hour regulations for a pilot who spends part of the week in crop spraying (exempt as agricultural work) and the balance of the week in outside sales work (also exempt from wage-hour laws). It is possible, Mr. Drew said, to combine these two exempt activities and still claim a total exemption for the employee that week, because these exemptions provide total exemption from both the minimum wage and overtime provisions of the act. This, of course, would not be true if the employee performed *any* covered non-exempt work during the week, Mr. Drew said.

Another situation discussed by Mr. Drew was the question of what tolerance would be permitted for a pilot who assisted in loading chemicals. While the wage-hour exemption for agricultural workers is construed narrowly when off-the-farm loading and mechanical work are involved, Mr. Drew said, this isolated element appears to be an incidental activity related to the pilot's otherwise exempt duties and such activity would not, therefore, defeat the pilot's exemption.

A third situation involves whether or not a pilot can perform pre-flight checkout activities, refueling, and on-the-spot mechanical repair under the term, "minor and incidental off-the-farm activity." Here, Mr. Drew said, the degree to which the activity is performed would have to be treated in the light of the facts of each case. Basically, he continued, off-the-farm performance of aircraft mechanical and servicing activities would defeat the exemption. Pre-flight check, however, a safety element, would appear to be a minor and incidental activity, as would flying the plane to the spray site. Emergency on-the-spot repair is again a practice for which no fast rule can be applied. If such activity involved more than a trivial amount of time, Mr. Drew concluded, it should be treated in the same light as other non-exempt activities.

Mr. Drew spoke at a recent meeting of the Arizona Aerial Applicators Association and issued the above information to answer questions which were raised at the meeting.

APPLYING GRANULAR HERBICIDES

There is nothing magic about granular herbicides. The effectiveness of the chemicals is not increased by their being in granular form, and they are only slightly, if at all, safer than liquids. A major consideration, however, is the kind of equipment that can be used to apply granules, and what kinds are available this year.

Hoppers, metering mechanisms, and spreading devices are the major components of granular application equipment. Existing augers, fluted wheels, fluted shafts, reciprocating chains and ropes, gravity feeds, and crop dusters have been successfully used to meter granular materials. Spreading devices are being modified by the equipment industry.

This article is taken from a discussion by W. G. Lovely, agricultural engineer, ARS, USDA, at the 12th Illinois Custom Spray Operators' Training School, Jan. 27-28, at Urbana, Ill.

IN 1959, the use of granular chemicals for pre-emergence weed control far exceeded the expectations of chemical manufacturers, equipment manufacturers, and research workers. Most of these applications gave satisfactory weed control with few indications of crop damage.

Because the results of last year's use were promising, and because some chemical and equipment manufacturers are pushing the sale of granular materials, the use of granular herbicides is on the increase in 1960.

Field studies on the use of granular herbicides for controlling weeds in field corn have been in progress in Iowa since 1954. Comparisons of liquid and granular applications of 2,4-D, Randox, Simazine, and Eptam show that granules are about as effective as sprays when used as pre-emergence applications. With 2,4-D, the sprays sometimes were slightly more effective than the granules at rates below two pounds per acre. Crop damage has occurred at the four pound acre rate with both sprays and granules.

Early post-emergence applications of 2,4-D granules at pre-emergence rates appear to be just as effective and somewhat safer than sprays. Applied just prior to shallow or regular cultivations, pre-emergence rates of 2,4-D granules have given good control with little or no crop damage. Working granules into the soil does not improve their effectiveness, except where a highly volatile chemical, such as Eptam, is used. Tests with 2,4-D, Randox, and Simazine show no advantage for soil incorporation.

There is nothing magic about granular herbicides. The effectiveness of herbicides is not increased by having them in granular form. For soil applications they will be only slightly, if at all, safer than liquids. Laboratory tests indicate that clay granules release the herbicide rapidly in the presence of water. Granules are easier and more convenient to apply than sprays, and this is their major advantage. A major consideration, however, is the kind of equipment that can be used to apply granules, and what kinds are available this year.

Hoppers, metering mechanisms, and spreading devices are the major components of granular application equipment. Earlier work done with attapulgite, tobacco, bentonite, perlite, celite, calcium carbonate, and vermiculite carriers shows that granules will flow through a machine easily if the hopper sides and bottom are kept at an angle steeper than 60° from the horizontal. The size of the hopper depends to a large extent on the carrier. For example, if vermiculite, which weighs 15 pounds per cubic foot, were used rather than bentonite, which weighs 75 pounds per cubic foot, the hopper would need to be five times as large to apply equal amounts of toxicant if the percentage formulation were the same. Planter attachments are most commonly used, and the hopper size should be such that filling corresponds with filling the seed or fertilizer hoppers.

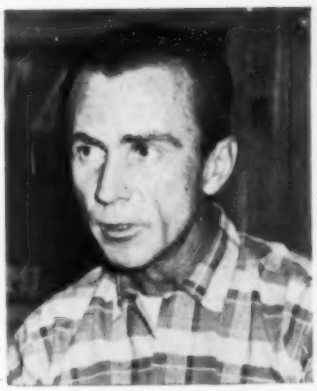
Augers, fluted wheels, fluted shafts, reciprocating chains, reciprocating ropes, gravity feeds with and without agitators, and crop dusters have been used successfully to meter granular materials. In recent corn borer tests, there was very little difference among the metering devices as measured by control obtained. In laboratory tests, all the above-mentioned types metered the granular materials adequately for herbicide application, except the dusters. Even these could be modified to do an adequate job of metering. In addition, studies with insecticides have indicated that aircraft applications of granular herbicides are feasible where an overdose of weed-killing chemical would not be injurious to the crop.

The spreading devices are being modified by the equipment

(Continued on Page 109)

Florida's Commercial Spraymen Hear State Licensing Regulations

John A. Mulrennan, Florida Board of Health, interprets new state regulations governing commercial spraying of lawns and ornamental shrubbery at a meeting of professional spray operators in Miami.



Miami lawn consultant Jim McQuaide sums up opposition to the law by saying that it puts the cart before the horse. What is needed, he says, is a law to protect the homeowners from themselves.

By Porter V. Taylor

NEW Florida regulations governing commercial spraying of lawns and ornamental shrubbery in residential areas went into effect last month. The regulations call for licensing of all persons engaged in the business of residential pesticide spraying and provide for a periodical listing, by the State Board of Health, of pesticides which can and cannot be used in residential areas.

In a series of meetings held in Miami, May 12, John A. Mulrennan, director of the Bureau of Entomology, Florida State Board of Health, met with representatives of the local press, commercial sprayers, and homeowners to explain the new law and answer questions. Other speakers at these sessions included Dr. S. H. Kerr, lawn specialist with the Florida Agricultural Experiment Station, and James Brogdon, entomologist with the Florida Agricultural Extension Service.

The majority of the more than 200 people attending the session held for commercial spraymen consisted of members of the horticultural spraying industry of Florida, although there were representatives from structural pest control companies and garden supply stores. Representatives also were present from such suppliers as Cal-Spray, Dow Chemical Co., Geigy, Gulfstream Chemical Co., Hector Turf and Garden Supply, Kilgore Seed Co., and O. E. Linck Co.

Mr. Mulrennan said that the regulations were prepared by his office after a number of deaths and serious illnesses had occurred in the state from the use of parathion. Newspapers, grand juries, and others were said to have beseiged the Health Department with requests for regulations. According to Mr. Mulrennan, the present regulations were compiled from suggestions by the State Department of Agriculture, the State Association of Agricultural Researchers, the State Association of County Health Officers, and representatives of the Florida Pest Control Association, the Horticultural Spraymen's Association of Florida, and individuals representing manufacturers, suppliers, and users.

The industry, however, appears to be evenly divided for and against the new regulation. The Florida Pest Control Association is seeking a court injunction to prevent enforcement, and the Horticultural Spraymen's Association of Florida is supporting the regulations. The Pest Control Association of South Florida has taken no formal action for or against, and individual manufacturers, suppliers, and spraymen are found on both sides of the question.

Conceding that the new law is not perfect, Mr. Mulrennan said that the citizens depend on the State Board of Health for protection of their health and welfare, and these regulations will do the industry more good than harm. Objectors charge that the regulations are discriminatory, inadequate, and designed for the benefit of special interest groups. The most vigorous objections stem from the fact that commercial or professional spraymen are subject to regulation, whereas the average homeowner or amateur can buy any of the chemicals listed as "restricted" from garden supply or food stories.

Mr. Mulrennan and other supporters say that additional regulations are being drafted to cover

(*Continued on Page* 117)

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Existing plants designed and constructed by C & I are represented here by the flags throughout the world. Due to the Earth's curvature, some of the plants cannot be shown.

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Growth, Importance and Problems of Agricultural Aviation

Among steps which the chemical industry might take to improve conditions under which aerial applicators operate is the furnishing of all fertilizers in pellet form in uniform bags so that they would be easier to handle and distribute accurately.

Applicators also would appreciate chemicals that are safer to handle and use than many presently available. Some toxic chemicals are relatively inexpensive and the applicator sometimes loses a sale if he refuses to apply them for a farmer.

by William A. Lewis
President, Texas Aerial Applicators' Association

ALTHOUGH historians may cite 1925 as the date agricultural aviation was placed on a commercial basis, its growth from 1925 to 1945 was very slow and painful. During this period, the general public and most aviation people, including the Civil Aeronautics Administration, had little knowledge or understanding of aerial applicator activities and agricultural aviation.

Except in the few remote rural areas where aircraft were used often for agricultural purposes, the "duster" pilot was considered to be a screwball, an outlaw, and just about everything else that came to mind. Most of this abuse resulted from the average person's lack of knowledge as to what an applicator had to be in order to make a living. For example, few people knew the trials and tribulations applicators put themselves through in efforts to convert and build a better duster each year from available aircraft.

Little did people know of the amount of salesmanship it took to sell, to new and skeptical customers, a product that takes weeks to show results. Little was known of the days when the applicator was on the job at 3 a.m. putting in four hectic hours of dusting before the average person went to work. Then the applicator would start on his selling job all day and be back at work dusting from 4 p.m. until dark. After dark, there was maintenance work to be accomplished and books to be put in order so that the next day's work could be carried out. It is little wonder, then, that the old-time applicator tended sometimes to resemble a tramp after a typical season of 15 to 18 hours a day spent around gas, oil, dust, chemicals, and grime.

In addition, few people were aware that aerial application is one of the very few aviation activities not operating on a government subsidy. It may be said, therefore, that the aerial applicator earns his living in the good, old-fashioned, American competitive way.

The estimated number of agricultural aircraft used during the period from 1925 to 1945 is 300. In 1945, however, at the end of the war, new life was put into the aerial application industry with the availability of low cost, surplus equipment and government-trained pilots. Many new chemical companies were formed, and new chemicals released for private manufacture came on the open market. As a result, the most rapid growth of the aerial application industry occurred between 1945 and 1950. In 1950, there probably were more operators, pilots, and planes than there have been since, but that year also produced the highest accident rate.

Agricultural aviation's sudden expansion, and the vast differences in its type of flying from standard flying procedures, caused large groups of the industry and public to become extremely alarmed and concerned. A close examination probably would indicate that agricultural aviation was at its lowest ebb in 1950. Many things, however, were in its favor. The farmer had realized the need for the airplane and the Civil Aeronautics Administration still was sticking to its policy of "wait and see" and

(*Continued on Page* 111)

PEST ROUNDUP

By Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U.S.

Insects Active In South During Spring

THE pea aphid was very active on alfalfa over a wide area by the latter part of April. Activity was noticeable as far north as Delaware and Maryland, where some counts were more than 100 per sweep, and into southern Illinois, where counts averaged slightly less than 100. The insect was on the increase in Missouri and Arkansas, and treatments were applied in some sections of Texas and Oklahoma. Heavy populations were recorded throughout Arizona.

The greenbug caused limited damage to small grains in localized areas of Texas and Oklahoma, where some treatments were applied. In some areas parasites, predators, and climatic conditions were reducing the populations. In areas of both Texas and Oklahoma, the spotted alfalfa aphid required treatment. Elsewhere in the southwest, populations of the insect were generally light.

During early April, the army cutworm, with populations of 2-5 per square foot, was reported infesting 500,000 areas of rangeland in southwestern and south central Idaho. Damage was confined to rangeland. Cutworms were also infesting several thousand acres of rangeland in Malheur County, Oregon.

Among the truck and garden insects, the cabbage looper was active in various areas. In Arizona, infestations of the looper were heavier and earlier than normal in lettuce and other crops. Treatment was required on lettuce in the Salinas area of Monterey County, California. The insect caused damage to vegetables in the Rio Grande Valley of Texas and to cabbage plantings in the Charleston, South Carolina, area. The potato psyllid caused damage to potatoes and tomatoes in the lower Rio Grande Valley of Texas and control measures were required. A thrips, *Frankliniella occidentalis*, was heavy on several crops from New Mexico, requiring controls in many instances.

Cotton insects were becoming active in several areas by the latter part of April. Thrips were reported from Georgia, Texas, New Mexico, and Arizona. Some treatments had been applied in Arizona by late April. Fleahoppers, aphids, spider mites, and boll weevils were reported from Texas, but all light. Some cutworm damage to cotton was reported in Zavala County, Texas.

In early April, a pink bollworm moth was taken in an electric light trap at San Luis, Yuma County, Arizona. Intensive surveys have failed to reveal any infestation in the county and all stub cotton and debris in the immediate area of the find were destroyed. There was a heavy emergence of pink bollworm moths in Maricopa County, Arizona, during early April. Eighteen moths were taken in light traps one night.

The spring surveys to determine the number of boll weevils surviving the winter were completed in Georgia and Tennessee during April. In Georgia, the surviving counts averaged 407 live weevils per acre of surface trash compared with 329 in 1959. Counts were made in McNairy, Tennessee, where the number of surviving weevils per acre of trash was 8,007. The average for the area in 1959 was 124. With favorable weather conditions, early season boll weevil damage can be expected in the west Tennessee area.

The western pine beetle and other species of bark beetles are seriously affecting forest stands in El Dorado, Nevada and Calaveras Counties, California. The heaviest damage is in El Dorado County where an estimated 6,850 ponderosa pines of all ages have been killed. The damage is increasing in certain areas.

Activity of the face fly, which became a concern on livestock in several states last season, was reported in April. Although reported earlier in the year from houses, the first reports of activity around livestock this season came from Delaware, New York, Ohio, and West Virginia. The New York report stated that in Tompkins County, heifers averaged about 25 flies, with the average being 10 per animal. Horses averaged 2-5 per head. The fly also was reported from Seneca County. Face flies first were seen in Wayne County, Ohio, April 20. The West Virginia report was from Greenbrier County. There were several reports of the fly being on horses in New Castle County, Delaware.

(Continued on Page 107)

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West Virginia Pulp and Paper

LISTENING POST

By Paul Miller

This department, which reviews current plant disease and insect control problems, is a regular feature of AGRICULTURAL CHEMICALS. The comments are based on observations of collaborators of the Mycology and Plant Disease Reporting Section, Plant Protection Research Branch, USDA, Beltsville, Md.

Peach Scab Control With Contact Fungicide

ACCORDING to Clinton H. Graves, Jr., and Ben C. Hurt, Jr. (3), of the Mississippi Agricultural Experiment Station, scab (*Cladosporium carpophilum*) is "one of the most costly diseases" with which peach growers in the southeastern states must contend. Every year its control requires numerous applications of fungicides. The causal fungus survives from season to season primarily in superficial twig lesions on which conidia are produced abundantly in spring and summer. Graves and Hurt investigated the feasibility of using a dormant spray to eradicate this major source of inoculum for early infection and thus reduce the number of current-season sprays needed to control the disease effectively.

They compared the regular seasonal schedule, in which captan (*N*-trichloromethylthio)-4-cyclohexene-1,2-dicarboximide) was used, and a shortened schedule in which the first two captan sprays were omitted, both with and without a dormant spray applied one month before the time of the first regular spray. The eradicant fungicide used for the dormant spray was phenyl mercury monoethanol ammonium acetate (sold under the trade name Puratized Apple Spray). All treatments that included the dormant spray provided superior control. In particular, the lasting protection afforded by the dormant spray when the first two seasonal sprays were omitted was a promising indication that better control could be obtained with fewer fungicidal applications, according to Graves and Hurt. They concluded, however, with the statement that additional field tests would be needed.

Bacterial Spot of Peach

Urban L. Diener and C. C. Carlton (2), of the Alabama Agricultural Experiment Station, write that lack of effective control measures has made bacterial spot (*Xanthomonas pruni*) the most destructive disease of peach trees in Alabama. In trials of various chemicals and antibiotics conducted since 1953, the first promising results were obtained in 1958 from applications of Dodine (*n*-dodecylguanidine acetate) and sulfur. In 1959 Dodine, by itself and combined with sulfur or Captan (*N*-(trichloromethylthio)-4-cyclohexene-1,2-dicarboximide) or both (plus insecticides), was tested again. Except in the combinations with Captan, Dodine caused some foliage injury. Addition of Captan prevented injury. Apparently, also, the bactericidal action of Dodine was increased when Captan was added. The Dodine-Captan and Dodine-Captan-sulfur combinations gave better control than either component used alone or than Dodine plus sulfur.

Diener and Carlton kept records of the amounts of peach scab (*Cladosporium carpophilum*) and brown rot (*Monilinia* that appeared in their experimental plots. All the treatments tested gave excellent control.

Control of "Dead-Bud"

A disease of sweet cherry in western Oregon, described by its name "dead-bud," was determined by H. Ronald Cameron (1), of Oregon State College, to be caused by a strain of the bacterium *Pseudomonas syringae*. In the Willamette Valley it has become serious and prevalent since 1953. After several years, during which bud losses of up to 70 percent were suffered, affected orchards became unprofitable and many were destroyed by the growers. The disease became a menace to the continuance of the cherry-brining industry in the area.

Of the twelve different chemicals that he tried out for the control of dead-bud, Cameron obtained best results from Bordeaux mixture or phenyl mercury triethanol ammonium lactate (sold under the trade name Puratized Agricultural Spray) used with a spreader-sticker, applied once or twice in late summer and again in autumn. Killing of buds on sprayed trees was reduced but yields did not increase for several years, until the trees had recovered from the effects of previous severe infection sufficiently to develop new spur systems. According to Cameron, with proper spraying badly affected orchards could be brought back as good commercial producers in 3 or 4 years.

Celery Early Blight

P. L. Thayer (4), of the Florida Agricultural Experiment Sta-

(*Continued on Page* 106)

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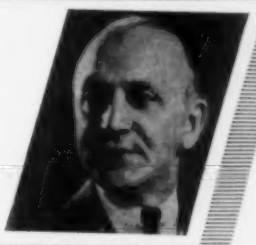


Dr. Vincent Sauchelli

Dr. Sauchelli is Chemical Technologist for National Plant Food Institute.

Fertilize The Soil or The Crop?

"Feed the soil."
"Feed the crop, of course."

A GOOD case can be made out for either recommendation. Fertilize generously, I say, so as to feed both the soil and the crop. This subject has been kicked about for many years. Perhaps it is not possible to give a straightforward, simple answer.

Those who advocate feeding the soil tell us that a sound program for profits is to build up a high level of fertility, especially of the minerals, phosphate and potash, ahead of planting. Such a built-in fertility will provide at all times a level of readily available plant food to ensure maximum yields. Nitrogen, in this program, is applied in supplementary doses for the sake of efficiency, since nitrogen losses in the form of nitrate may possibly occur. Also, in this program, are included applications of substantial amounts of limestone, at regular intervals, to supply nutrient calcium and to reduce soil acidity. If the feed-the-soil-program is followed, the row placement of fertilizer becomes less important.

Those who recommend feeding the crop, believe it is more profitable to place the fertilizer where it can be most readily utilized by the plant. They emphasize that, in many soils, phosphate and potash may be "fixed" by soil agencies, and consequently put out of circulation. Small dosages placed along the row, they say, will return the most for each dollar invested in fertilizer. They seem to forget that the objective should be to achieve the most profit per acre.

The great majority of farmers are not using enough fertilizer, any way you judge their programs, so that perhaps the discussion is more or less only of academic interest. Maybe, not.

You will perhaps agree that a brief review of some of the better established facts of fertilizer behavior and of how crops feed may give this discussion needed substance. Let us consider what fertilizer is, how it should be used and for what purpose.

First, we should have a definite understanding of the two concepts which are in conflict. Soil is a complex, dynamic biological equilibrium. The products of this dynamic interrelationship of earth, chemicals, organic materials and billions of microorganisms furnish the true food for plants. In other words, the soil is to be regarded as a living unit, which through its alchemy generates the food that plants can utilize. Fertilizer then, according to this concept, is not a specific food for plants; it is raw material that is converted to plant food through the chemical and biological agencies of the soil.

Opposed, is the concept which considers soil merely as a physical support for plants, and convenient trough for holding soluble materials used as food by the plant. The fertilizer, therefore, is there in solution to feed the plant directly as its specific needs may require. In other words, the fertilizer is plant food, ready to be used.

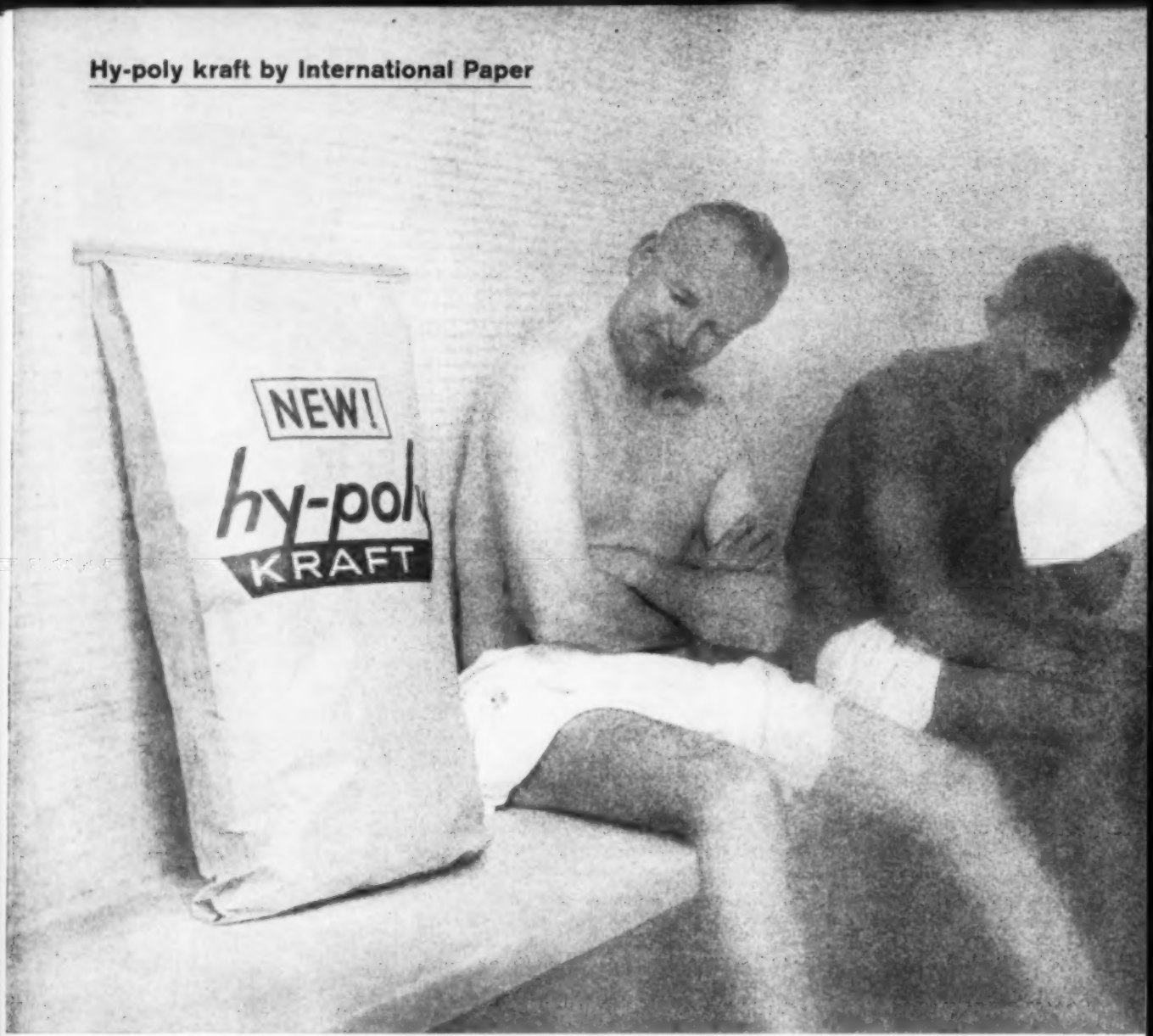
Soil scientists and plant physiologists in general point out that fertilizers in the soil become components of the colloidal complex comprising clay and humus and are acted upon by biological agencies. Plants get their nourishment as a product of this intricate, dynamic system. This intricate interrelationship defies simple description.

Two fundamental characteristics of the soil must be appreciated if this discussion is to mean anything. First, the soil is biologically alive. Take away the living, microbial fraction, and it is merely dead, inert rock particles. Secondly, its colloidal properties determine the nature and release of food to the plant. Thus, soil fertility and its relation to crop feeding is governed by the state of its living, microbial population and by the electrical properties of its non-living, colloidal complex. These two mutually dependent characteristics of a soil will at all times definitely influence the behavior of applied chemical fertilizers. Soil fertlity becomes the resultant of these several interactions. Soil fertility is something more than just the mixture of fine rock particles and chemicals in solution; it is the result of the vital nature of the soil. Conditions that favor the microscopic organisms in the soil, will also ensure healthy plant growth. For the supply of nitrogen, phosphorus, sulfur and the other plant food elements depends entirely on the metabolism of this teeming microscopic life in the upper few inches of the soil.

That the total amount of living organisms in a soil is substan-

(*Continued on Page* 101)

Hy-poly kraft by International Paper



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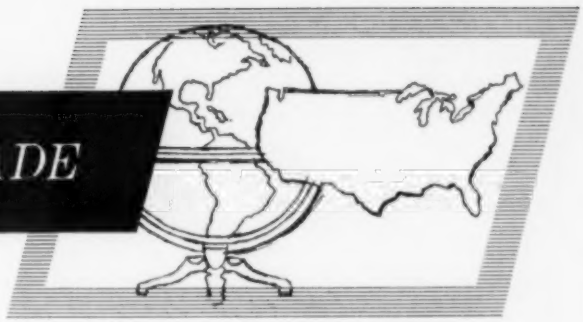
NEWS about the TRADE



Shepard Honored By USDA

Dr. Harold H. Shepard, chief of the Agricultural Chemicals Staff, Food and Materials Division of the Commodity Stabilization Service, received a Superior Award from Secretary of Agriculture Benson on May 17th. The award was for leadership in "developing, improving, and publishing pesticide statistics; and for significant contributions to defense planning relating to emergency distribution of agricultural chemicals."

Under Dr. Shepard's supervision two publications well known to our readers—"The Pesticide Situation" and "The Fertilizer Situation"—are issued annually. His book, "The Chemistry and Action of Insecticides," is a standard reference work. Dr. Shepard, as editor, in collaboration with other authorities in their respective fields, has issued two volumes of the manual "Methods of Testing Chemicals on Insects."

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Penick Shifts Division

The Farm Chemical and Insecticide Division of S. B. Penick & Co. will establish new headquarters in St. Louis, Mo., on July 1. The new location will be 4161 Beck Avenue, St. Louis 16.

Products sold by the Division will be stocked at St. Louis, providing one more shipping point in addition to those existing for all divisions in New Jersey, Chicago, and on the West Coast.

•

Start Weed Research Group

A Weed Research Organization is being started by the Agricultural Research Council of England to assume some of the present functions of the council's Unit of Experimental Agronomy at Oxford University.

To provide facilities for the new organization, the A.R.C. has acquired a farm near Oxford where a laboratory and other buildings will be provided. Director of the new organization will be Dr. E. K. Woodford, at present assistant director of the A.R.C. Unit of Experimental Agronomy.

•

County Agent Award To Wilson

Louis H. Wilson, secretary and director of information for the National Plant Food Institute, Washington, D. C., has been awarded a citation by the National Association of County Agricultural Agents for his "untiring efforts . . . valued counsel and advice and productive service in the improvement of American agriculture."

IMC Names Dahlberg

Henry W. Dahlberg, Jr. has been named administrative manager for Agricultural Chemicals Division-Sales by International Minerals & Chemical Corp., Skokie, Ill. Mr. Dahlberg heads a new administrative department which will handle many of the financial and administrative functions previously handled by the division's four sales departments.

•

Work Starts On Greek Plant

Work has begun on the construction of a nitrogenous fertilizer plant in Ptolemais, northwest Greece. The plant is expected to be completed in the spring of 1962.

Ammonium Sulfate Switch To Liquid Recommended

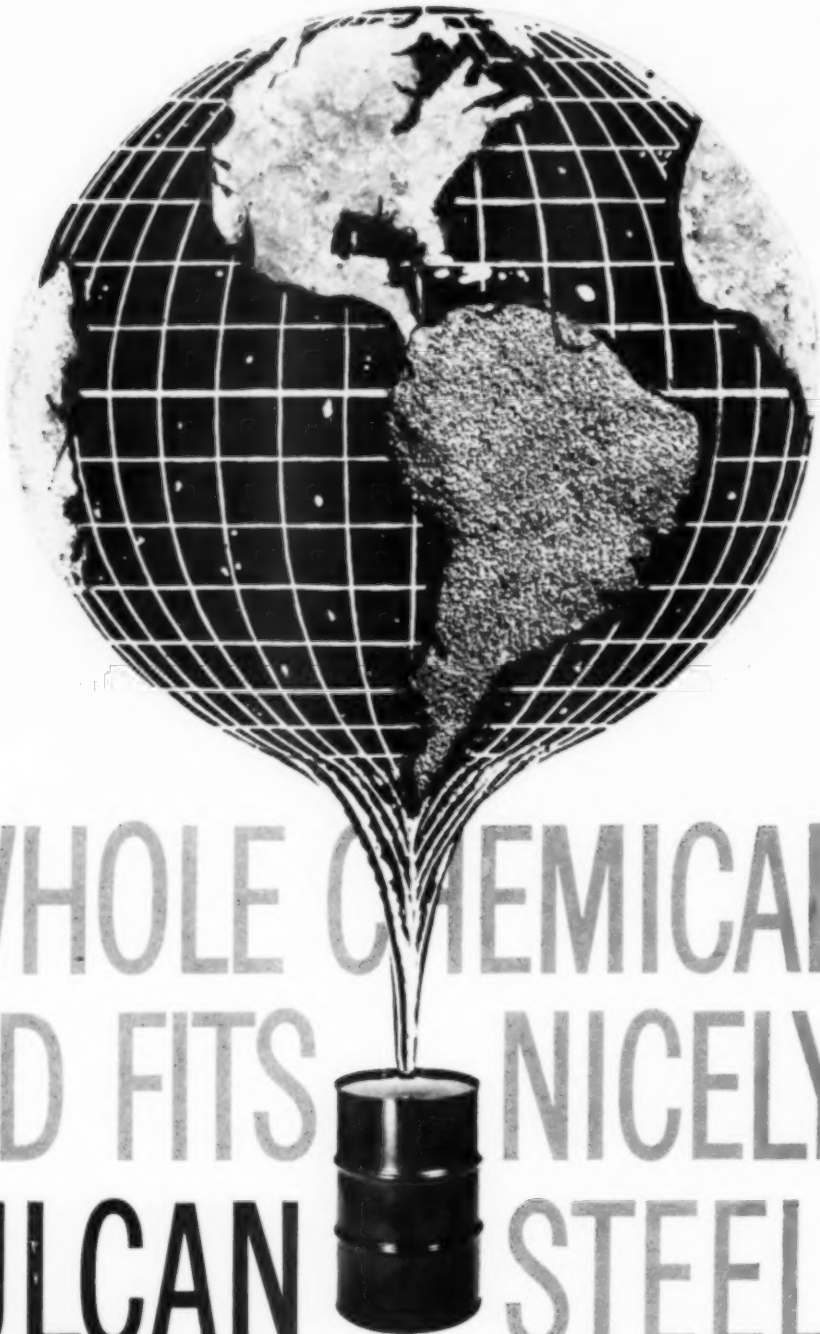
A PRACTICAL way out of the ammonium sulfate surplus situation that plagues coke producers of the by-product material was suggested last month by Chester S. Edwards, president of Nitrogen Products, Inc., New Brunswick, N. J., at a meeting of the American Coke and Coal Chemicals Institute at Rye, N. Y. Mr. Edwards recommends a switch from solid ammonium sulfate to production of coke-oven ammonia liquor.

Mr. Edwards said that stocks of coke-oven sulfate were more than 150,000 tons at the end of last March, compared with 118,000 tons at the same time in 1959, despite low output last year because of the steel strike.

One ton of ammonia produces four tons of sulfate, he pointed out. A ton of sulfate (25 per cent NH_3) sells for $32, or $128 for four tons. From this $128, $80 is subtracted, which is the approximate cost of the four tons of sulfuric acid required to make it.

This, he continued, leaves the cokeoven producer a maximum of only $8, before freight equalization, for a ton of ammonia in the form of sulfate. "I can assure you," he told members of the institute, "that your return per ton of ammonia in the form of 30 per cent liquor would be considerably more, and that the potential market for liquor is large enough to consume present surplus cokeoven ammonia."

Additional advantages cited by Mr. Edwards were: elimination of purchasing and using sulfuric acid; production of a more concentrated nitrogen product than sulfate; greater ease of handling a liquid over a solid; and the lower cost of storage in tanks.



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AC-60

Weaver Joins Memphis Staff

F. Wayne Weaver has joined the sales staff of the Memphis district of W. R. Grace & Co., Grace Chemical Division. His territory includes Arkansas, Louisiana and Oklahoma.

Mr. Weaver formerly was fertilizer salesman for Phillips Petroleum Co. and had been plant manager and salesman for Tennessee Liquified Gas Co.

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Control Officials To Meet

Representatives of the American Feed Manufacturers Assn., Chicago; the National Plant Food Institute, Washington, D. C.; and the Chemical Specialties Manufacturers Assn., New York, will address the 18th annual meeting of the Association of Southern Feed and Fertilizer Control Officials, June 20 to 22, at the Riverside Hotel in Gatlinburg, Tenn.

W. E. Glennon, president, AFMA; Paul T. Truitt, president, NPFI; and Alfred A. Mulliken, secretary, CSMA, will discuss their respective organizations' activities as they pertain to the activities of the control officials. Among other speakers will be: Dr. W. G. Duncan, U. of Kentucky, Lexington, who will talk on the use of computers in analysis of fertilizer company records based upon inspection samples; and Dr. William D. Bishop, U. of Tennessee, Knoxville, and James R. Turner, U. S. Borax and Chemical Corp., Knoxville, who will present a discussion entitled "Industry-College-Regulatory Agency Joint Program Opportunities."

A session is to be devoted to pesticides and residues during the meeting and will feature talks by Denis Hayley, director of information, National Agricultural Chemicals Association, on "Pesticides and Public Relations;" and Samuel Alfend, chief, Cincinnati district, Department of Health, Education and Welfare, on "The Food and Drug Administration's Program on Pesticide Residues in Dairy Products and Other Food." A talk entitled "Killing Bugs Without Chemicals" will be presented by Eugene H. Holeman, state chemist, Tennessee Department of Agriculture, Nashville; James Jonakin, U. of Tennessee; and Leo Hardin, U. of Tennessee, Agricultural Extension Service, Knoxville.

•

Amchem Offers Sesone

Amchem Products, Inc., Ambler, Pa., recently took over the responsibility for sales and further development of Sesone herbicide and is making the material available in two pound bag size and in fifty-pound drums.

•

Named To Chemagro Sales

F. R. Johnson has been appointed assistant director of sales of Chemagro Corp., Kansas City, Mo. He had been the company's technical sales representative in the western states.

Crown Building At Bogalusa

Construction began last month at Bogalusa, La., on Crown Zellerbach Corp.'s chemical complex for the production of dimethyl sulfide and dimethyl sulfoxide. The Fluor Corp. Ltd., Los Angeles, is performing the engineering and construction of the installation.

The new plants will operate in conjunction with Crown Zellerbach's pulp and paper mill at Bogalusa.

•

Plant Food Group To Meet

The Pacific Northwest Plant Food Association will hold its annual convention, Nov. 3 and 4, in Boise, Idaho. Co-chairmen for the meeting are Trevor Steele, American Potash & Chemical Co., Salem, Ore.; and Huntington Cummings, Huntington Cummings, Inc., Walla Walla, Wash.

Literature Stresses Safe Pesticide Use

BOOKLETS and articles in trade and consumer press stressing the theme "Pesticides Can be Used Safely" are being circulated by government and industry. Most recently, the USDA has issued three leaflets directed respectively to the producer of: field crops, livestock, fruits and vegetables. Read and heed the label is emphasized in all literature.

In this same campaign, Dr. Wayland J. Hayes, Jr., medical director, chief, toxicology section, Communicable Disease Center, Technical Development Laboratories, U. S. Department of Health, Education and Welfare, Savannah, Ga., has prepared an excellent article, "Pesticides in Relation to Public Health". The article appears in volume five of the *Annual Review of Entomology*, and reprints are being distributed in the agricultural chemicals industry by the National Agricultural Chemicals Association.

"Pesticides promote health", observes Dr. Hayes, "directly through the control of vector-borne diseases and indirectly through increased and improved agricultural production. On the contrary, the extensive use of any biologically active chemical implies a potential hazard, which has to be evaluated." In the article, Dr. Hayes elaborates on the benefits to health, and thoroughly analyzes the toxicology problem.

"There have been no cases of illness in the United States from insecticide residues on food when formulations have been used according to directions. The same is true in Britain." Dr. Hayes cites several instances of poisoning where insecticides were used improperly.

"It is important to realize that the alarm (concerning pesticide use) which has been expressed is not shared by scientists who actually have studied insecticides, nor by the vast majority of physicians. During years of investigation, it has been impossible to confirm the allegation that insecticides, when properly used, are the cause of any disease either of man or animals. When misused, however, they may produce poisoning".

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Q – How much experience is built into the design?

A – You get the benefit of 84 years of practical experience in each Sturtevant machine you buy. Unrivaled for fertilizer and insecticide plant engineering know-how, Sturtevant originated the 'Unit' idea. Whether your need is for a replacement pulverizer or mixer, or a completely modern granulating unit, Sturtevant-engineered machinery always can be depended upon to fit your requirements like a glove.

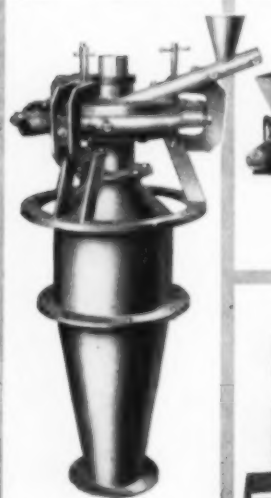
Q – Is the machinery engineered for peak-load efficiency?

A – All details in each Sturtevant machine have been proved by years of peak-load performance. Rugged construction that withstands the most slam-bang use, gears designed to always perform dependably, bearings that stand up under the heaviest loads, all can be taken for granted in Sturtevant machinery. Many Sturtevant machines have been operating at top capacity and efficiency for well over a quarter of a century.

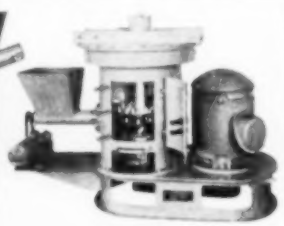
Q – How accessible is the machinery for clean-outs and repairs?

A – Clean-outs are a constantly recurring problem in the operation of fertilizer and insecticide plants. And minor repairs on hard-to-get-at machinery can consume hours of costly man and production time. Sturtevant's practical "Open-Door" design guarantees quick accessibility — for clean-outs and repairs. Any parts requiring cleaning or maintenance are quickly exposed by "One Man in One Minute."

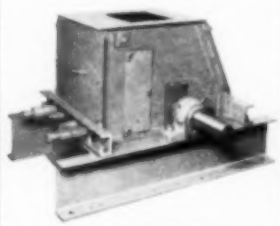
For rugged, reliable, efficient machinery you can depend upon for years — or for engineering assistance in planning or upgrading your unit — it will pay you to consult Sturtevant. Write to STURTEVANT MILL COMPANY, 123 Clayton Street, Boston 22, Mass.



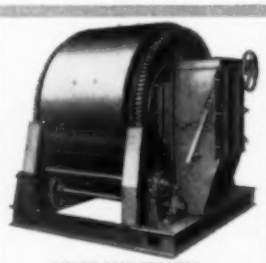
MICRONIZER



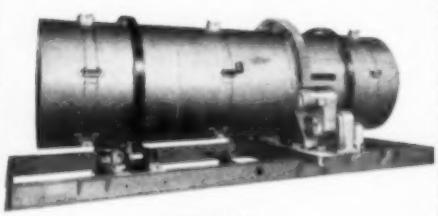
PULVER-MILL



ROTARY PULVERIZER



MIXER-AMMONIATOR



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The "OPEN-DOOR" to *lower* operating costs over *more* years

TVA Ships Liquids By Barge

The Tennessee Valley Authority last month sent a barge of liquid mixed fertilizer to Dubuque, Iowa, in what was said to be the first such shipment on the Mississippi River, The material came out of TVA's plant at Muscle Shoals, Ala.

The high cost of shipping liquid fertilizers over long distances by truck and rail, and shortages of appropriate transportation facilities during peak season rushes, has made the barge method attractive, according to TVA. The fertilizer is being used by Ris-Van, Inc., in a grass-roots demonstration program being held in cooperation with TVA. Ris-Van is a subsidiary of Stepan Chemical Co., Chicago, and is located in Belmond, Iowa.

Dr. John L. Strauss, vice president of Ris-Van, is shown making a preliminary test of the liquid fertilizer in the barge.

•

Atomic Fertilizer Possible

Research personnel at the Atomic Energy Commission's Brookhaven National Laboratory, Upton, N. Y., have disclosed the possibility of a "chemonuclear reactor" which could make ammonium nitrate fertilizer out of air, water, and uranium.

Exposure to radiation would cause the nitrogen and oxygen in the air to combine into nitrogen dioxide. Electric power from the reactor could be used for electrolysis to extract hydrogen from water and the hydrogen could be made into ammonia by adding nitrogen. The ammonia and the radiation-produced nitrogen dioxide then could be combined conventionally to make ammonium nitrate.

Cost of the process, however, would be 30 to 40 per cent higher than for conventional methods, according to the A.E.C., but they are hoping that further research will make radiation processes economically competitive.

•

OK Guthion For Tobacco

Guthion has been registered by the U. S. Department of Agriculture for use on tobacco. It has been used for controlling insects on deciduous fruits, cotton, nuts, and certain vegetables.

Field tests indicate that Guthion controls tobacco flea beetles, tobacco hornworms, budworms, and aphids. A product of Chemagro Corp., Kansas City, Mo., Guthion is available in both a 25 per cent wettable powder and a spray concentrate formulation.

NY Mosquito Control Program

A three-pronged program involving helicopters, spraying by truck, and a campaign to enlist the efforts of city residents was begun in New York last month in an effort to control mosquitoes. Dr. Morris Greenberg, director of the Bureau of Preventable Diseases for the city, said that the drive was being intensified this year because of the outbreak of mosquito-borne encephalitis last year that was blamed for 21 deaths in New Jersey.

Helicopters chartered by the city's Health Department will spray 7,000 acres of fresh-water and salt-water marshland in all of the city's boroughs except Manhattan every two weeks. Truck crews of the Borough Presidents' offices are spraying roadsides and wooded areas, and home owners are being encouraged to drain or spray stagnant water near their residences.

Supreme Court Decision Bars Co-Op Monopoly

THE United States Supreme Court last month set narrow limits on the antitrust exemptions given to agricultural cooperatives. The court held unanimously that cooperatives are not exempt from the antitrust laws when they attempt to monopolize wholesale or retail trade, conspire with others to eliminate competition, or make acquisitions which may substantially lessen competition.

The ruling is the result of a suit by the Justice Department against the Maryland and Virginia Milk Producers Assn. under Sections 2 and 3 of the Sherman Act and Section 7 of the Clayton Act to stop "predatory trade practices." The Clayton Act itself, and the Capper-Volstead Act, provide some antitrust exemptions for farm cooperatives.

But Justice Hugo L. Black, writing for the court, said these exemptions do not permit a cooperative to attempt monopoly by coercing non-members or to acquire outside assets tending to lessen competition.

The Maryland-Virginia association is a large and wealthy cooperative of dairy farmers in the Washington, D. C., area. It includes most of the area's milk producers, and it is the exclusive source of milk for most of the big Washington dairies. In 1954 the association bought the Embassy Dairy, the largest that had bought milk from farmers not members of the cooperative.

The Government challenged the acquisition under Section 7 of the Clayton Act, which prohibits members whose effect "may be substantially to lessen competition or to tend to create a monopoly." The purchase also was attacked as a violation of Section 3 of the Sherman Act. This section prohibits contracts and conspiracies in restraint of trade, and the contention was that the contract for the purchase of Embassy Dairy was such a device. Finally, the Government said that the association's conduct over the years, not only the Embassy purchase, was designed to achieve a monopoly in the milk market.

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Texaco offers chemical solutions that consistently meet your formulations' requirements as to ingredient quality.

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because of its centrally located Lockport (Ill.) facility, Texaco provides immediate delivery of both nitrogen solutions and ammonia (including 50% aqua solution).

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Texaco offers a wide range of technical services to help you break a production bottleneck or develop a new product.

To **BALANCE** fertilizer formulations ...begin with this Texaco formula

Here's a formula that can help you balance all the factors effecting fertilizer formulations. The ingredients? You can see them above: Texaco quality, availability, and service.

But why not weigh the advantages of this service yourself? Write for details—and our free 40-page manual on ammonia and nitrogen solutions—to Texaco Inc., *Petrochemical Sales Division,* 332 South Michigan Ave., Chicago 4, Ill., or 135 East 42nd Street, New York 17, N. Y.

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NPFI SW Representative

E. K. Chandler, formerly district representative of the National Plant Food Institute at Knoxville, Tenn., has been assigned responsibility for the four southwestern states of Arkansas, Louisiana, Oklahoma, and Texas. His headquarters are in Shreveport, La.

Mr. Chandler, prior to his affiliation with the Institute, had been assistant professor of agronomy research at the Louisiana State University's North Louisiana Hill Farm Experiment Station at Homer.

•

C. H. Jefferson Advanced

C. H. Jefferson has been appointed chief of the Feed, Fertilizer, and Pesticide Section, Plant Production Division, Canada Department of Agriculture. He succeeds C. R. Phillips, who recently was named director of the division.

Mr. Jefferson joined the Plant Production division in 1947 as an inspector in New Brunswick. He was transferred to Ottawa in 1948 and was made supervisor of the pesticide unit of the Feed, Fertilizer, and Pesticide Section in 1957.

•

Allied To Expand Research

Allied Chemical Corp. is planning a major research expansion which will more than double the laboratory facilities of its General Chemical division near Morristown, N. J. Construction is expected to be completed in the last quarter of 1961.

•

McLaughlin Named Sales Mgr.

Philip H. McLaughlin has been named general sales manager for the Century Chemical Corp., New York. Prior to joining Century, Mr. McLaughlin had been manager of the sales department and the technical service department of Stauffer Chemical Co.

•

Cyanamid Names Winners

Winners of the first of a series of three national Malathion contests for formulator salesmen recently were announced by the American Cyanamid Co., New York, sponsors of the contest. Contestants were asked to answer questions pertaining to the proper use of the insecticide and to complete a sentence on the virtues of Malathion in less than 26 words.

The grand prize, an outboard motor, went to H. J. Ostlind of Milton-Freewater, manager of the California Spray-Chemical Corp.'s Oregon Branch.

Offer Combination Mulch

Potlatch Forests, Inc., Lewiston, Idaho, is marketing a combination fertilizer, mulch, and soil builder tradenamed Garden-Lawn Food. It is made of tree bark by a process that involves heating urea, phosphoric acid, and cellulose, and combining them with the natural cellulose contained in the bark.

IMC Surveys Fertilizer Freight Problems

A FIELD survey, conducted last month by International Minerals & Chemical Corp., Skokie, Ill., indicates that more than 25 per cent of fertilizer manufacturers are faced with a specific transportation plant-location problem. The field study, made in the past three months, covers some 239 fertilizer firms.

The results of the study, according to IMC, indicate that the trade is teeming with opportunities to make transportation and traffic service a major selling tool. The company's transportation specialists uncovered 59 traffic problems —most of them easily solved. Problems involving routing and freight rates were the ones most frequently encountered. In one typical case, IMC found an ammonium sulfate purchaser paying a maximum $3.68 per ton rate because he was taking shipments in freight cars with insufficient capacity to qualify for the special $3.27 per ton rate applicable to shipments of 100,000 pounds or more. The carrier now is attempting to supply larger cars. If they are unavailable, the carrier will make the low rate applicable to the smaller shipment size.

In another example, IMC found a customer reluctant to erect a new plant because it had been quoted an $8.10 per ton rate plus a $5 per ton local charge on phosphate rock. A recheck revealed that the $5 per ton local charge did not apply.

For a corn-belt customer, IMC computed for each element in two formulas; pounds needed; freight rates by various modes; cost per net ton of product, both from present plant and proposed new site.

Freight service comprised another main problem area. In one instance, a phosphate rock account was hobbled by shipment scheduling difficulties, demurrage charges, and overtime payments because rail service was available only on Mondays, Wednesdays, and Fridays. By getting the carrier to move some shipments through a second routing point, somewhat further away, that has service on Tuesdays and Thursdays, the customer now gets daily delivery.

Rates and service, however, were only two of the key problem areas turned up by the IMC survey. The company also found that many fertilizer firms had serious problems in evaluating the traffic aspects of plant location and warehousing; in negotiating with carriers (for such services as rail spurs to new plant sites); in technical traffic assistance; in getting freight cars and barges during shortages; in interpretation of tariffs; and in getting action on damage claims.

Eight IMC traffic members, including director of transportation Eugene Landis and assistant director Walter Kornst, are conducting a series of customer visits to help work out transportation problems. Much of the difficulty with faulty rates and service, said Mr. Landis, can be blamed "on local freight agents who are unfamiliar with the existence of special rates and schedules . . . and on companies that haven't the time or manpower to bring their problems to the carrier."

Sports Illustrated Joins Anti-Pesticide Publications

ARMED with an oversize illustration showing dead robins, which are said to be "sad evidence of killing power of pesticides," *Sports Illustrated* magazine has joined the growing list of publications attacking chemical pest control programs.

In the weekly magazine's May 2 edition an article entitled "The Deadly Spray," by John O'Reilly, nature editor, repeats many of the standard charges heard about such spray programs as those carried out to control fire ants, gypsy moths, and Dutch elm disease. (See April, 1960 *Agricultural Chemicals*, pages 83, 84).

Not only concerned with the effect of pesticides on wildlife, the article states, ". . . man's chemical warfare against his insect enemies has at last reached the point where it threatens the well-being of man himself. The multimillion dollar campaign waged by the Department of Agriculture against the imported fire ant has brought the whole question of the mass use of pesticides into violent focus. Yet the spray program for fire ant control is only one of several in which scientific investigators have found alarming results."

Although Mr. O'Reilly does supply the names of some of his "scientific investigators," he neglects to list their affiliations or the fields in which they are scientifically trained. For instance, "Damage to birds and mammals was reported by T. G. Scott, Y. L. Willis, and J. A. Ellis from applications of dieldrin for control of Japanese beetles in Illinois." Also, an "alarming result" of DDT was disclosed when "Professor Richard J. Graham found fish dying 90 miles below the treated watershed."

An innovation in the *Sports Illustrated* article, as compared with some of its predecessors that have become somewhat repetitious over the years, is the inclusion of Justice William O. Douglas' dissenting opinion to the Supreme Court's refusal to review the decision of a lower court that upheld the gypsy moth spray program of 1957. Also included is mention of the proposed Chemical Pesticides Coordination Act currently being considered in Congress that would require advance study of the "effects upon fish and wildlife before any federal program using chemical pesticides could be undertaken."

Mr. O'Reilly, in keeping with the *Time-Life* standards of journalism, seems to have done more research on the subject than have his predecessors in the anti-spray campaign, but, also in keeping with the *Time-Life* standards, he has presented the reader with only his interpretation of the facts, rather than letting his audience decide for itself whether or not there actually is "a threat to human health." *Sports Illustrated* is a publication of Time, Inc.

In a final paragraph, entitled "A View of Blackest Pessimism," the article quotes a Dr. George J. Wallace of Michigan State who holds that: "The current widespread and ever-expanding pesticide program poses the greatest threat that animal life in North America has ever faced—worse than deforestation, worse than market hunting and illegal shooting, worse than drainage, drought or oil pollution and possibly worse than all of these decimating factors combined." The article concludes on a more temperate note by quoting Dr. Clarence Cottam, director of the Welder Wildlife Foundation, Sinton, Texas. (Dr. Cottam, by the way, is one of the article's few "scientists" who are identified in any way. The others are Dr. Robert Cushman Murphy, "the ornithologist," and Archibald B. Roosevelt, "son of President Theodore Roosevelt.") Dr. Cottam calls for "selective and specific pesticides which we can use to control pests without significant detrimental effects to other public values or to other members of the biota which are of high economic, social or recreational importance. It has been done before." Dr. Cottam concludes, "The possibilities are there, and the promised rewards are worthy of our best efforts."

In this same issue, by the way, *Sports Illustrated* said that Tompion would win the Kentucky Derby.

•

SW Fertilizer Meeting

The activities of the National Plant Food Institute in the Southwest will be discussed by Paul Truitt, president of the NPFI, at the opening session of the Southwestern Fertilizer Conference and Grade Hearing, July 27 to 30, at the Galvez Hotel in Galveston, Texas.

Among other speakers will be: Dr. M. B. Sturgis, head of the department of agronomy, Louisiana State University, Baton Rouge, who will talk on the importance of the fertilizer industry; C. B. Spencer agricultural director, Texas Cottonseed Crushers Assn., Dallas, who will discuss improved methods of applying fertilizer; and Dr. John E. Hutchinson, director of the Texas Agricultural Extension Service, who's topic will be of Texas intensified soil fertility program.

Also on the program will be: Woody M. Miley, Arkansas Agricultural Extension Service, who will discuss Arkansas demonstrations and soil testing programs; Enoch T. Nix, Bossier Bank & Trust Co., Bossier City, La., who will talk about lending agencies; and Ralph Everett, Empire Sales Training, Inc., Miami, Fla., who will suggest ways to clinch a skeptic with better salesmanship.

Arcadian® News

Volume 5 | For Manufacturers of Mixed Fertilizers | Number 6

"It's a pleasure to serve you!"

"The 1959-60 fertilizer season has been a difficult one. Exceptionally cold weather in the Southeast delayed the start of the season in that area, and the heavy movement began in the Midwest as soon as it did in the Southeast.

"This overlapping placed a heavy strain on our tank car supply and, in spite of the fact that in the past year we spent several million dollars for additional storage, it has been difficult for us to keep up with shipments.

"Unfortunately, we must arrange for cars a year ahead of time and to make accurate estimates that long in advance is extremely difficult—especially since our estimates may be affected, as they have been this year, by weather conditions. You may be assured, however, that we will always do our best to give our customers the service they deserve.

"Although all returns are not yet in for the season it looks to us as though the consumption of plant food in the United States will increase again this year; nevertheless the increase will be much less than last year.

"It has been a pleasure to serve you during this season as it has for the more than thirty years we have been supplying nitrogen to the fertilizer industry. We expect to be serving the industry for many more years and we recognize that to do this we must continue, as in the past, to supply not only the best possible products in a wide range, but also the technical service and research facilities founded on our long experience."

Jacob White

JACOB WHITE, President

NITROGEN DIVISION
Allied Chemical Corporation
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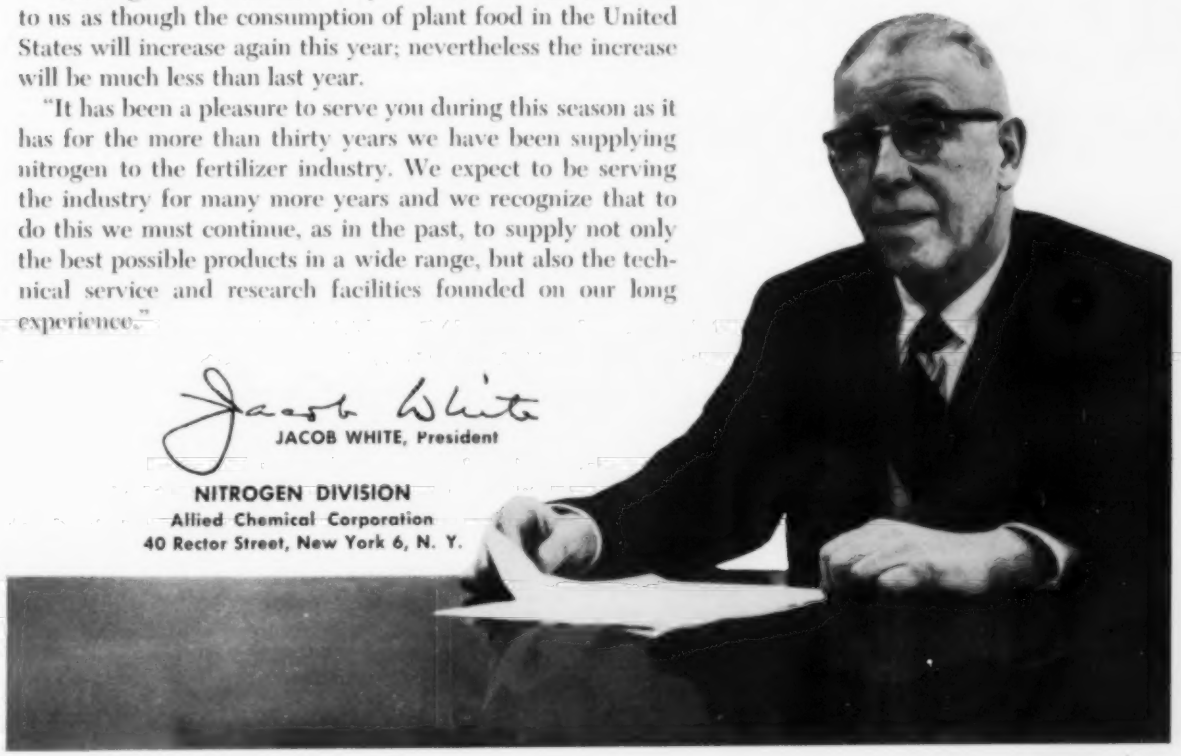
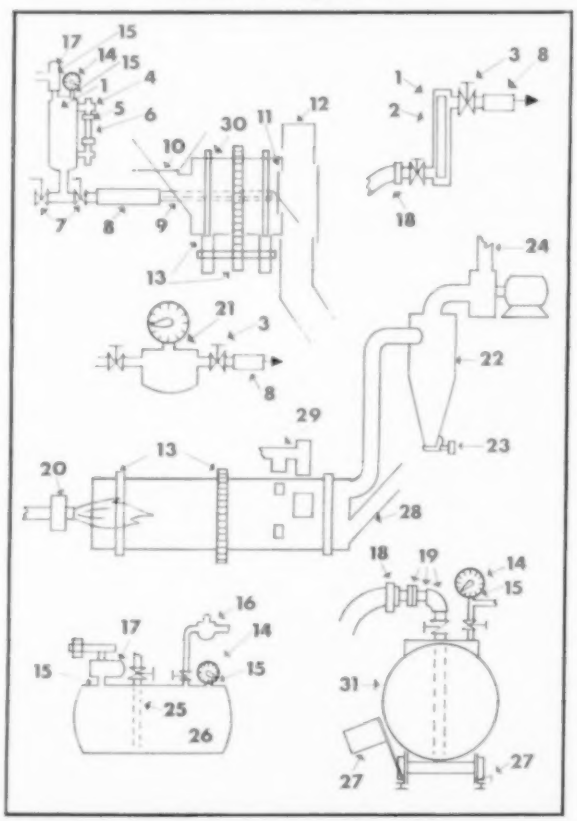


Arcadian News for Fertilizer Manufacturers . . . . . from NITROGEN DIVISION

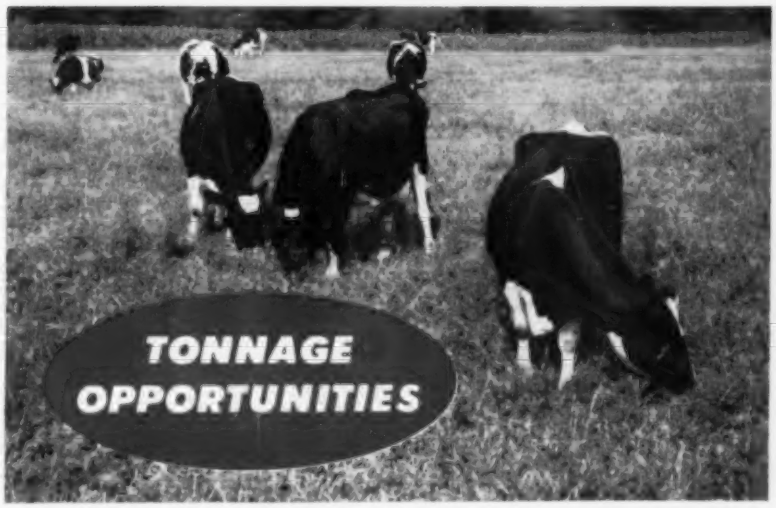
Handy check list for your equipment

Here are some of the points to check to insure safe and efficient operation:

Action Needed	OK	
☐	☐	1 Measuring tanks, rotometers – use correct specific gravities.
☐	☐	2 Rotometer. Check float for wear and corrosion. Shield against breakage. Avoid mechanical strains and shocks of starting and stopping.
☐	☐	3 Throttle on discharge side – to minimize vaporization of nitrogen solutions.
☐	☐	4 Gauge glass connections – fittings – free for easy cleaning. Dirt here causes faulty proportioning.
☐	☐	5 Extra gaskets for gauge glasses.
☐	☐	6 Clean glass tubes. Make sure you have spare tubes. Add guards.
☐	☐	7 Valves. Check for wear. Have spare parts on hand. Overhaul annually.
☐	☐	8 Rubber hose to reduce vibrations.
☐	☐	9 All distributor pipes for design and condition.
☐	☐	10 Mixer inlet gate for leakage.
☐	☐	11 Mixer discharge door for leakage.
☐	☐	12 Rotary batch mixer. Avoid suction in mixer.
☐	☐	13 Tires, trunions, ring gears and pinion for alignment, wear and safeguards.
☐	☐	14 Pressure gauges – for ammonia service? – accurate? Do not let pressure continue to rise. These are not clocks.
☐	☐	15 Location of gauges and safety valves on storage tanks. If connected into or near high velocity air line, they are not accurate during movement of air.
☐	☐	16 Pressure regulators. They are not safety devices.
☐	☐	17 Pressure and vacuum reliefs. Check operations. Remove weights unofficially added.
☐	☐	18 Hose connections. Adequate stainless steel bolted clamps. Safe if loosened under pressure?
☐	☐	19 Tank car connections. Stainless steel and short for strength and permanence. Use elbows to avoid hose kinks.
☐	☐	20 Dryer burner – clean, adjust, and check controls. Synchronize with drying load. Question unusual demands on the dryer.
☐	☐	21 Displacement meters. Lose accuracy at low rate of flow and with gas bubbles. Avoid strains and shocks.
☐	☐	22 Dust collector. Check for condensation, caking, deterioration, overloading. Clean fan blades.
☐	☐	23 Check for air leaks at dust collector discharge.
☐	☐	24 Stacks. Check for fouling, corrosion, and build-up.
☐	☐	25 Storage tank dip pipes. Check for leaks.
☐	☐	26 Tanks. Check for weakening by corrosion, and failure of any coating or lining.
☐	☐	27 Tank cars. Always blue flag and block wheels.
☐	☐	28 Large air leaks at material inlet of countercurrent dryers severely handicap the dryer.
☐	☐	29 Safeguards for hammers and other parts when working or falling off.
☐	☐	30 When using acids make certain all mixing is uniform for safety and good analyses.
☐	☐	31 Compare production records with shippers weight for quick check on outrun or for troubles in the process.



OTHER PRECAUTIONS: Make sure operators have proper training and instruction. Equip them with rubber gloves and goggles. Have good lighting and safe exits. Keep safety literature handy. Have gas masks and a supply of water for emergencies. Emergency shower baths should be freeze-proof and warm for cold weather.



NOW is the time to sell PASTURE FERTILIZERS

A well-known soil scientist says "We don't have pastures, we have playgrounds for cattle!" And there are more acres of grassland and pasture than of any other crop. Good, well-fertilized pastures can produce milk cheaper than any other source of feed. And good pastures can produce as much feed value as corn but they need as much fertilizer as corn.

June—after the first flush of spring growth is grazed off—is an ideal time to push mixed fertilizers for grass and legume pastures. Analyses, such as 16-8-8, 15-10-10, 12-12-12 and 10-10-10 are excellent fertilizers for pastures now.

Sell 12-12-12, 10-10-10 or 15-10-10 as soil builders to raise the level of phosphorus and potash in the soil. Then sell 16-8-8 to keep production at high levels by replacing the plant food as it is used.

Early summer fertilization brings on strong second growth of grass as well as legumes to keep green feed coming along through the hot months. Even when the ground gets dry, the extra growth is already there to provide grazing. Where pastures can be irrigated, summer fertilization produces a big tonnage of nutritious grazing, with up to 18 to 20% protein content.

In most states the best farmers are now applying fertilizer several times during the years—fall, early spring, and June. The better farmers apply fertilizer after each hay cutting. With irrigation or high rainfall, good farmers will apply mixed fertilizer after each grazing period. Add some customers like this and you'll be busy during the slack season. Mid-season applications of plant food are often straight nitrogen but the evidence shows that potash is more efficient if applied frequently. When you promote high-nitrogen mixed fertilizers such as 16-8-8 or 15-10-10 you provide a balanced complete program at every application.

Technical Tips

UREA HELPS PULVERIZED FERTILIZER PRODUCTION

More and more producers are discovering the advantages of the urea-ammonium nitrate-ammonia-water solution over the conventional ammonium nitrate-ammonia-water formula. Let's examine the reasons why this addition of urea is so beneficial to fertilizers.

At the outset, let us agree that the term "pulverized fertilizer" embraces only those fertilizers that are processed on a once-through basis, with no mechanical drying, and under moisture and temperature conditions that produce little or no agglomeration. In general, no or hardly any acid is used in formulation. Nitrogen solution is used to the extent of the capacity of the superphosphates to react with the free ammonia; ammonium sulphate is generally used to provide any additional nitrogen that might be desired.

Greater Flexibility

One of the principal reasons why the urea-ammonium nitrate-ammonia-water solution is to be recommended is the greater flexibility it allows in formulation. For example, this type of solution makes it possible to have a lower percentage of free ammonia for a given nitrogen total without increasing the salting-out temperature. Also, for the same free ammonia and the same nitrogen total, the presence of urea permits a solution of much lower salting-out temperature. This could be a major advantage to mixers faced with winter temperatures and no heat.

Improves Condition

Another reason for using a urea-added solution is the fact—backed by many case histories in the industry—that the use of a limited amount of urea in some pulverized grades results in improved condition of the product. At the very least, the use of the urea-added solution provides the mixer of such fertilizer grades with a convenient way of including urea in his formulation without the bother of storing and processing an additional raw material.

Past experience has shown several reasons for the observed improvement in product condition when a urea-added solution is used. One is the effect of urea on the crystallization of ammonium chloride. Here the urea acts to suppress the tendency of ammonium chloride to form a network of interlocking needle-like crystals which are thought to promote caking. Also, the decreased vapor pressure of fertilizer made with urea solutions reduces the degree of drying out in storage. This results in fewer crystal bridges being formed between particles, thus making a softer material.

Increased Nitrogen Solubility

A third reason for using urea is the greater solubility of total nitrogen in the urea-added solution as compared to the ammoniating solution with the same free

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ammonia content but without urea. It's also true that once the free ammonia in comparable solutions has been reacted in the mixer, the remaining urea-added solution has a much lower salting-out temperature than the non-urea solution. To illustrate: a solution containing 34% free ammonia, 60% ammonium nitrate and 49% total nitrogen would salt out at 212°F after the free ammonia is removed. A solution of the same total nitrogen but composed of 33% free ammonia, 45.1% ammonium nitrate and 13% urea would salt out at 117°F after removal of free ammonia. It's quite possible that this property of increased solubility could result in more uniform distribution of nitrogen on the other fertilizer solids, particularly where mixer temperatures are low.

While admitting all these benefits of using a urea-ammonium nitrate-ammonia-water solution in preference to the conventional ammonium nitrate-ammonia-water solution, dissenters point out that urea-added solutions are more hygroscopic than non-urea solutions. This cannot be denied, but the fact is, for many pulverized fertilizer grades, increased hygroscopicity has actually shown definite advantages. Accordingly, we can conclude that pulverized fertilizer manufacturers would be well advised to use urea-added solutions for just about every grade they produce.

Tariff Revision Sought

Canadian chemical producers, in an effort to obtain a larger portion of their domestic market, have begun a campaign for a revision of Canada's tariff laws.

Peter Allen, president of Canadian Industries Ltd., said that the revision is needed for more "equitable tariff treatment." The industry feels that imports are largely to blame for a more than 33 per cent drop in profits by Canada's chemical industry over the past ten years.

Farm leaders, however, feel that the revision would lead to higher prices on fertilizers, pesticides, and other agricultural chemicals. The Canadian Federation of Agriculture told the Tariff Board of Canada that a key industry proposal—to revise the tariff structure in such a way that rates would be determined by chemical grouping instead of the present end-use grouping—would limit the present tariff exemptions on imported goods for use in agriculture.

•

Marlin G. Geiger Dies

Marlin G. Geiger, executive vice president of W. R. Grace & Co., died May 13 while aboard a chartered plane landing in Linden, N. J., on a trip from Baltimore. He was 62 years old. Mr. Geiger apparently suffered a heart attack.

•

Encephalitis Area Sprayed

Aerial spraying for mosquito control began last month in the southern areas of New Jersey where equine encephalitis was a problem last year. An emergency appropriation of $20,000 was provided by the state to take care of costs until July 1 when the new fiscal year begins.

•

Utah Pesticide Conference

Nearly 125 persons interested in agricultural pesticides attended a conference on the subject May 18 in Salt Lake City, Utah. In summarizing the discussions at the conference, Dr. W. H. Bennett, dean of agriculture at Utah State University, said "we cannot maintain today's high standard of living without the use of these chemicals."

Speakers included Dr. Roy Hansberry, assistant director of the Shell Oil Co. development division, who spoke in behalf of manufacturers; and Ariel Jorgensen, state commissioner of agriculture, who outlined the responsibilities of his department and those of spray operators and salesmen.

Niagara Building 2 Plants

Two new pesticide production units—one at Greeley, Colo., and the other at Ayden, N.C.—now are under construction for Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N.Y.

The new plants will turn out a wide range of pesticides, and are scheduled to be completed by summer.

Position Of Industry Outlined At HR 11502 Hearings

TESTIMONY was heard last month on a bill (HR 11502) introduced by Rep. Leonard G. Wolf of Iowa to require any federal agency in, or planning to engage in, a program of pest control to consult in advance with the Fish and Wildlife Service and "appropriate state authorities" before undertaking such programs.

The legislation was strongly endorsed at the hearings by representatives of the Audubon Society and other wildlife conservation organizations.

Industry's position on the bill was outlined in a letter submitted by Lea S. Hitchner, secretary of the National Agricultural Chemicals Association. He said that the legislation is unnecessary because administrative action can, and is, being undertaken that would serve the same purpose. The agricultural chemicals industry is in full accord that there should be close coordination and exchange of information between various agencies involved in pest control programs, he said.

While the aims of the legislation are sound, Mr. Hitchner added, it is conceivable that the bill would jeopardize control programs needed to meet arising emergency situations that might affect agriculture or the public health. Mr. Hitchner said that, in addition to a coordinating committee already operating in the government, the National Academy of Sciences now is forming a group of scientists to study the entire problem of pest control in relation to wildlife conservation. It also will look into the operation of government agencies in pest control programs. Mr. Hitchner urged that the legislation be delayed until this study is completed.

Daniel H. Janzen, director of the Bureau of Sport Fisheries of the Fish & Wildlife Service, endorsed the objectives of the bill to conserve wildlife, but said that the bill is premature and that a number of its provisions would make it administratively impractical. He proposed that the basic law on wildlife conservation be amended to spell out procedures needed to provide desired coordination and exchange of information in this field.

Dr. W. L. Popham, deputy administrator of agricultural research, USDA, argued against the bill because it puts primary emphasis on protection of wildlife and thus subordinates other values to national welfare. He said that there is much misunderstanding and many misleading reports concerning the Department of Agriculture's pest control program and added that there have been frequent consultations between scientists of the different agencies concerning these programs.

Dr. Popham noted that the amount of pesticides used in programs sponsored and financially supported by the department account for only three per cent of the total domestic consumption of pesticides.

Prentiss Announces Availibity Of New Organic Phosphate

AN announcement of the commercial availability of a new organic phosphate insecticide, "Butonate", was made at a press conference sponsored by Prentiss Drug & Chemical Co., New York, during the meeting of Chemical Specialties Manufacturers in Chicago, May 15-18. The insecticide was developed by J. E. Casida and B. W. Arthur of the University of Wisconsin and is licensed by the Wisconsin Alumni Research Foundation. Prentiss is the first of the insecticide formulators to offer Butonate formulations commercially, and has announced the following preparations under the "Prentox" label: 1) Butonate Technical; 2) 25% Butonate Emulsifiable Concentrate; 3) 20% Butonate Oil Soluble Concentrate; 4) Pybuton Concentrate #16 (contains piperonyl butoxide and pyrethrins).

Chemically, the product is O,O-dimethyl 2,2,2-trichloro-1-n-butyryloxyethyl phosphonate. It is a cholinesterase inhibitor like most organic phosphate insecticides. Radio tracer studies have shown that the low mammalian toxicity of butonate is attributable to rapid debuturylation and phosphatex hydrolysis. The compound has an acute oral LD_{50} of 1100 mg/kg and dermal LD_{50} of 7000 mg./kg. based on experiments with adult white rats. Prentiss indicates that due to the low concentrations in finished formulations, butonate can be considered one of the least hazardous of the residual insecticides.

Butonate may be formulated as an oil spray, an emulsion, wettable powder, or dust. Optimum levels of butonate and additives have not been established, advises Prentiss, however, experimental work has indicated that .8% butonate alone or .4% butonate in combination with pyrethrins or a synergized pyrethrum has given effective control of household insects.

Little work has been done on agricultural insects to date, however, tests indicate that satisfactory control was obtained in the laboratory against adult pea aphids in 48 hours with .35% butonate. Against the larvae of the southern armyworm and Mexican bean beetle, satisfactory control was obtained at .1% and .05% in 48 hours. At dosages of .35% and .1% satisfactory laboratory control was obtained in 5 days against *Tetramychus atlanticus mites.*

As with most residual insecticides, butonate has limited knockdown properties, therefore it is suggested that butonate be formulated with pyrethrins and a synergist, when knockdown or flushing action is desired.

Potash Foundation Formed

A Foundation for International Potash Research has been established by six U. S. potash producers —American Potash and Chemical Corp., Duval Sulphur and Potash Co., International Minerals and Chemical Corp., Potash Co. of America, Southwest Potash Corp., and U. S. Borax & Chemical Corp. — to develop programs for "efficient and beneficial use of potash" in various countries around the world.

Dr. H. B. Mann, president of the American Potash Institute, also is president of the new foundation. "It has become important to find new markets for the American potash industry," Dr. Mann said," because the industry has developed its production capacity beyond the requirements of North America."

•

Fertilizer From Pulp Waste

The University of California has reported the development of a virtually no-waste, nitric acid-ammonium hydroxide process to make pulp from wood chips, sawdust, and other residues from California's logging operations, and at the same time to convert effluent into fertilizer. The new process is based on the old nitric acid pulping process, but ammonium hydroxide is used instead of sodium hydroxide.

In a first-stage reaction, wood chips are treated with nitric acid. Spent acid liquor, which contains residual nitric and organic acids from the partially dissolved wood, is drawn off and stored, while the treated wood chips are extracted with ammonium hydroxide. In the second stage, ammonium hydroxide treatment removes the wood material (lignin and some carbohydrate) solubilized in the acid stage. The acidic and basic solutions are combined. Excess ammonium hydroxide neutralizes the acid extract, and the solution is distilled to remove any excess ammonium hydroxide. A virtually neutral solution of ammonium salts of organic acids and some residual nitric acid, that can be concentrated or used as is for fertilizing, is produced.

According to Dr. David L. Brink, it is anticipated that all of the nitrogen going into the system will be available as nitrogen for plant growth, except for that lost as gas during the reaction. Preliminary pot culture tests to estimate the nitrogen-supplying fertilizer potential of the treated effluent appear promising and indicate by their nitrogen analysis that 10 to 26 per cent N would be available.

•

Price Hikes Announced

Allied Chemical Corp. announced May 31 that it will raise the prices of ammonia and nitrogen solutions by $4 a ton. The increase for anhydrous ammonia, to $92 a ton from $88, will be effective Oct. 1. Nitrogen solutions, currently selling at $128 a ton, will be priced at $132, effective Jan. 1.

At the same time, Spencer Chemical Co. announced it is boosting the base price of ammonium nitrate fertilizer from the current $68 a ton price to $70 a ton, effective Jan. 1.

Before the price increases take effect, however, the products will sell at customary off-season discounts.

Niagara To Build Research Center At Middleport

A research center that is expected to be one of the most modern of its kind for pesticide research will be built at Middleport, N. Y., by the Niagara Chemical Division of Food Machinery and Chemical Corporation. Construction is expected to begin this summer.

Included in the new facilities will be laboratories for the identification and measurement of minute chemical residues on crops; an improved organic synthesis section; and expanded biological screening and formulation laboratories.

Architect's rendition shows office unit, modern laboratory facilities, and four large greenhouses extending from the rear.

Floridin Marks 50th Year

The fiftieth anniversary of the Floridin Co., Tallahassee, Fla., was observed last month with a celebration in Tallahassee. Floridin is a subsidiary of Pennsylvania Glass Sand Corp. and its mines and processing facilities are located in Quincy, Fla.

Floridin's anniversary celebration was climaxed by a birthday party sponsored by the Tallahasee Chamber of Commerce in cooperation with local, county, and state officials.

•

Register Dyrene For Lawns

Dyrene, a foliage fungicide manufactured by Chemagro Corp., Kansas City, Mo., now is registered in the U. S. and Canada for control of dollar spot, melting-out, and rust on lawns and turfs. It also is registered for control of leaf spot on gladiolus in the U. S.

•

M&C, Philipp Plan Merger

A merger of Minerals & Chemicals Corp. of America and Philipp Brothers, Inc., an import-export concern, has been proposed by their boards of directors. The merged corporation would be known as Minerals & Chemicals-Philipp Brothers, Inc.

James Deshler, chairman of Minerals & Chemicals, will continue as chairman, with Siegfried Ullman, president of Philipp Brothers, becoming vice chairman of the company. Charles A. Specht, president of M&C, will retain that post in the new company.

Along with Philipp Brothers, Inc., its subsidiary, Philipp Brothers Ore Corp., will be merged into Minerals & Chemicals.

•

Dow Premerge Granules

A new granular formulation of Premerge is being offered for weed control in bean crops this year by the Dow Chemical Co., Midland, Mich. The granules can be applied simultaneously with crop planting and have the same per-unit activity as does the company's liquid Premerge product.

•

To Double Chemical Output

Hungary's second five-year plan will aim to double the value of the output of the country's chemical industry, with two-thirds of the investment to be used for increasing production of fertilizers, plastics, and synthetic fibers.

For nitrogenous fertilizers, the Tiszapalkonya plant is to be expanded by 100,000 metric tons per year and the Kazincbarcika plant will be doubled in size and its process switched from coke to natural gas. Also planned are a 300,000 metric tons per year superphosphate plant as a division of the Tiszapalkonya combine, and two new 100,000 metric tons per year sulfuric acid facilities.

•

Nitrogen Measuring Method

A method for helping farmers to measure exactly how much nitrogen they are losing from their soils has been deveolped by C. M. Gilmour and W. B. Bollen, microbiologists at Oregon State College, Corvallis. Known as a Respirometer, the device used in the new method measures the escaping gas and provides clues to conditions which cause the escape.

The Oregon tests indicate that only slight amounts of nitrogen are lost when the soil is well aerated and is not water-logged. When nitrogen fertilizer is added to wet, poorly-aerated soil, however, much nitrogen escapes into the atmosphere. High losses, therefore, can be avoided by not applying nitrogen fertilizer to water-saturated soil containing plant remains, Dr. Gilmour explains.

Additional experiments are planned to learn how much trash should be left and exactly under what conditions.

•

Heyden Newport Elects 2

James K. Lindsay has been elected vice president and secretary, and Bernard L. Reiter has been elected treasurer, of the Heyden Newport Chemical Corp., New York.

Mr. Lindsay joined the corporation as secretary in 1953. He was elected treasurer in 1956. Mr. Reiter has been assistant treasurer since 1956. He joined Heyden Newport in 1952.

•

Stauffer Names Ad Director

Elwood M. Myers has been named to the newly-created post of director of advertising by the Stauffer Chemical Co., New York. He had been director of advertising for Victor Chemical Works, now a division of Stauffer.

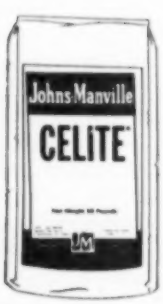
WETTABLE POWDER INSECTICIDES ARE MORE POTENT

REMAIN FREE-FLOWING...

when formulated with

CELITE

diatomite fillers



The ability of Celite* diatomaceous silica to absorb its weight in water or oil pays off for insecticide formulators in two ways. (1) Celite absorbs large quantities of liquid poisons while retaining the easy-to-handle properties of a dry dust. (2) Celite's powerful anti-caking action keeps dusts free-flowing and assures uniform poison dispersion in wettable powders prepared by final packagers.

Pound for pound, Celite gives you far greater performance than other inerts since only ten pounds give you a full cubic foot of extender. Celite gives you far greater value since it absorbs up to 50% more poison than other diluents on a dollar-for-dollar basis.

A Celite field engineer will be glad to give you the full story. Call your nearest J-M office or write Johns-Manville, Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products

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INDUSTRY'S MOST VERSATILE MINERAL FILLER

JOHNS-MANVILLE JM PRODUCTS

US To Pay For Berry Losses

The Government announced last month that it would pay up to $8.02 a barrel to cranberry growers hurt when sales were halted last fall. Details of a payment program, authorized on March 30 by the White House, were announced by the Department of Agriculture.

The payments are expected to be about $10,000,000. They will go to growers in the producing states of Massachusetts, New Jersey, Wisconsin, Oregon, and Washington. The USDA set $10.34 a barrel as a fair return for the cranberry crop of 1959. The amount of payment will be determined by subtracting the amount a grower has received or will receive for his crop from the $10.34 base price. In no case, however, will the payment be more than $8.02 a barrel. No payment will be made on contaminated berries.

At the same time, the USDA announced plans to make about 12,000,000 pounds of caponettes, withdrawn from the market last winter because of stilbestrol treatment of the birds, available to states for distribution to welfare institutions. The birds will be processed to remove all the skin, liver, and kidneys, the only parts where residues of the chemical were said to have been found. The USDA said that the white and dark meat was wholesome.

•

Gen. Chem. Names Woods

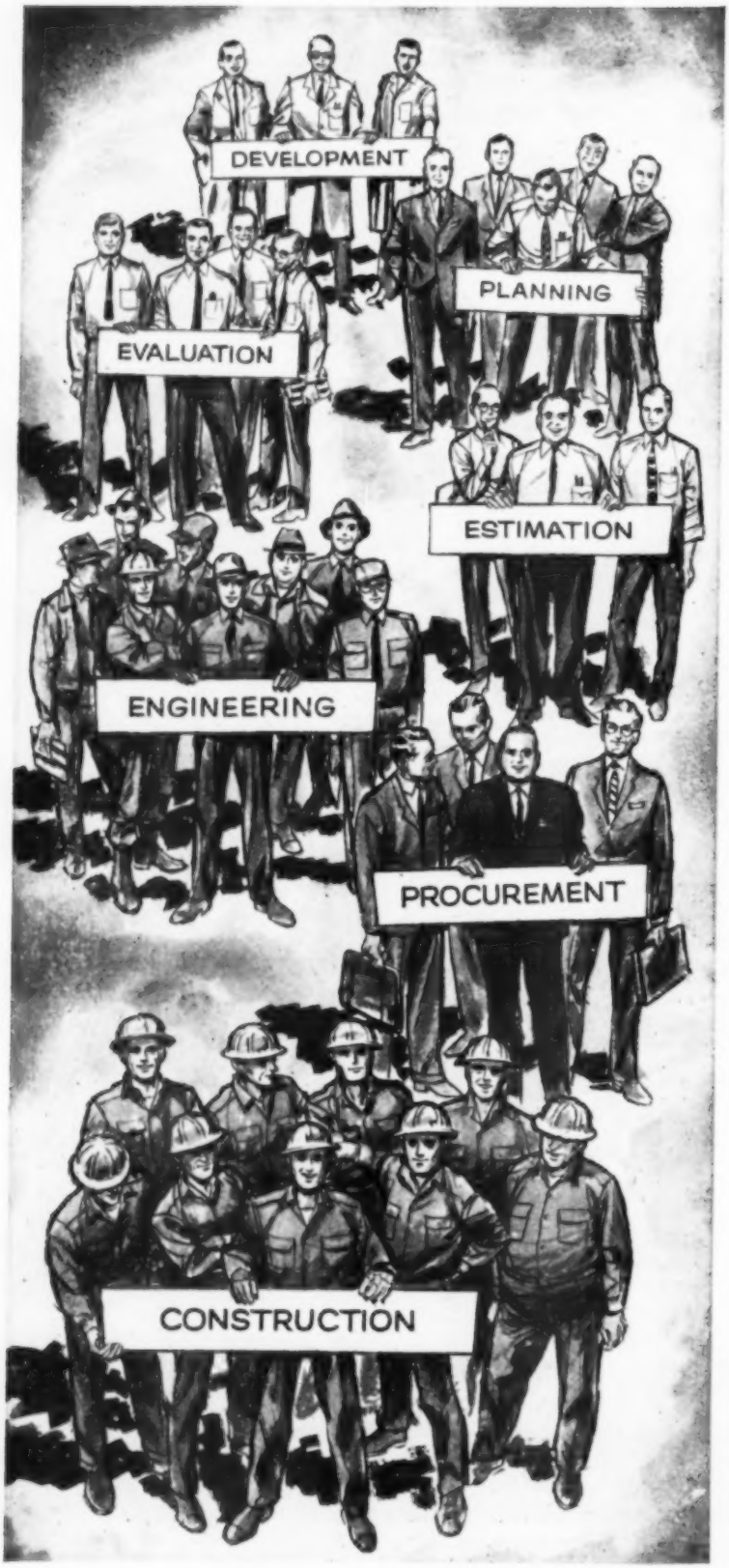
Frank J. Woods has been appointed director of sales of Allied Chemical's General Chemical Division, New York. He has been with the division for 22 years.

For the past ten years, Mr. Woods has been heavy chemical sales manager for the division. During World War II, he served as supervisor of industrial relations for General Chemical Defense Corp., a subsidiary which was operated for the government in Point Pleasant, W. Va.

To Address Safety Session

Elmer C. Perrine, chairman of the Fertilizer Section, National Safety Council, will open the Fertilizer Section's sessions at the 48th National Safety Congress and exposition October 17 in the Morrison Hotel, Chicago.

Also on the program is a talk on mouth to mouth resuscitation by Harry A. Veditz, Maryland Casualty Co., Baltimore, and a panel discussion on disabling injuries. Participants on the panel will include: Mike Ellison, protection supervisor, Mississippi Chemical Corp., Yazoo City; W. J. Emond, director of automobile safety, Armour and Co., Chicago; R. L. Freemon, supervisor of the safety and services department, Butler Chemical Co., Galena Park, Texas; Norman Maddox, plant manager, Florida Nitrogen Co., Tampa; and C. L. Riley, safety supervisor, O. M. Scott and Son Co., Marysville, Ohio.



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Considering a new fertilizer plant or a modernization and expansion program? Leonard has the organization and the "know-how" to meet your project needs surely, swiftly, on schedule. Seven Leonard teams work together under an able project supervisor to close the gap between contract and "on stream" capacity production.

They can place world-wide design, engineering and construction experience at your service. It includes intimate knowledge of plants and processes for sulfuric acid, phosphoric acid (Prayon Process), superphosphate and triple superphosphate.

To help you get started, Leonard specialists will be glad to discuss with you some of the modern improvements you can make in commercial fertilizer production. Call them in *early* to get the very best return on your next plant investment.

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Atlantic-Vulcan To New Plant

Atlantic-Vulcan Steel Containers, Inc., has announced the completion of a new building and the commencement of full scale production at Peabody, Mass. The new plant is producing a full line of steel pails in sizes ranging from 1½ to 7 gallons. The containers are available in both open and closed head and with all standard pouring openings.

Atlantic-Vulcan is one of seven steel container plants which recently merged to form Vulcan-Associated Container Companies.

•

Tucker, Leyman Join Merck

Donald E. Tucker and Daniel J. Leyman have been appointed agricultural products sales representatives for the Merck Chemical Division of Merck & Co., Rahway, N.J. Mr. Tucker's territory includes southern Georgia, southern Alabama, and Florida. Mr. Leyman is covering northern Indiana and western Michigan.

Prior to joining Merck, Mr. Tucker was associate district manager for Lindsey-Robinson, Farmville, Va. Mr. Leyman had been regional supervisor for Fromm Laboratories, Grafton, Wisc.

•

Selleck Joins Monsanto

Dr. George W. Selleck has joined the Monsanto Chemical Co., St. Louis, as a project manager in the agricultural chemicals section of the Organic Chemical Division. He had been assistant professor of plant ecology for the University of Saskatchewan.

•

Safety Schools Set

The dates for the 1960 training school, sponsored by the National Plant Food Institute, in cooperation with the National Safety Council, on accident prevention in fertilizer plants, have been announced. The schools previously had been held in 1958 and 1959 in an effort to improve the accident record of the fertilizer industry.

The northeast school will be held in New York, Aug. 10 and 11; the midwest school is scheduled for Aug. 16 and 17 in Chicago; and the school for the southeast will be held in Wilmington, N. C., Aug. 25 to 27. Schools for the far west and the southwest will be held in Fresno, Calif., and New Orleans, La., during October or November.

TVA Sees More Fertilizer Use

TVA agricultural economists foresee an annual use of 10,000,000 tons of commercial fertilizer per year by 1975 because of an increased rate of fertilizer use and a growing population, according to *Fertilizer Trends*, a biennial TVA publication.

Consumption of the three primary plant nutrients at the present time is about 6,500,000 tons per year.

NOW! FOR INCREASED MOISTURE RESISTANCE and thinner coatings...

USE MULTIWALL BAGS WITH *New* HIGH-DENSITY POLYETHYLENE COATINGS

IDEAL FOR PACKAGING

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SEED
PESTICIDES
AMMONIUM NITRATE
AND OTHER
FERTILIZERS

Because of a major breakthrough in resin technology by Union Carbide, chemicals and other agricultural products may now be packaged in Kraft multiwall bags coated with BAKELITE *high-density* polyethylene.

In addition to providing equal or better moisture resistance than low-density coatings approximately *twice the thickness**. . . laboratory tests at Union Carbide show that high-density coatings provide greater interior abrasion resistance and are *20 times* more effective than low-density coatings of the same thickness as a barrier to greases and high penetrating oils. And, multiwall bags coated with high-density polyethylene can be used on standard bagging and closure equipment.

For further information, see your packaging supplier, or write: Dept. AH-2, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, New York. *In Canada:* Union Carbide Canada Limited, Toronto 7.

* Determined in a 360-hour moisture pickup test conducted by International Paper Company on 50-lb. Kraft bags, polyethylene coated, and filled with *calcium chloride*.

UNION CARBIDE

BAKELITE and UNION CARBIDE are registered trade marks of Union Carbide Corporation.

Armour Plant In Operation

Armour Agricultural Chemical Co.'s new liquid and dry fertilizer plant near Centralia, Missouri, now is in operation. Located four miles west of Centralia on U. S. Highway 22, the new plant will offer complete liquid fertilizers and bulk, dry fertilizer, custom-formulated to farmers' specifications, along with Pebble Plant Food in bags and bulk, liquid and solid nitrogen materials, and Armour's Vertagreen plant foods.

In addition to the diversified product line, the plant is equipped to offer custom application of liquid and dry bulk fertilizers and will have available on a rental basis equipment for the application of these materials.

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To Buy Potash Properties

Texas Gulf Sulphur Co., Houston, Texas, will acquire and commercially develop Delhi-Taylor Oil Corp.'s Utah potash properties, according to an announcement released by the two companies.

Delhi-Taylor will retain a 25 per cent interest in the properties, which consist of two potash reserve areas in southeastern Utah. Exploration work has been carried on by Delhi-Taylor since 1953. Commercial development is expected to begin upon completion of a complete examination of the "technical aspects" of the project by Texas Gulf. C. F. Fogarty, vice president and manager of exploration for Texas Gulf, said that "if everything went according to schedule," the company will go into potash production on its new properties in 1961.

Reserves at the Mesa site above the Colorado River near Dead Horse Point are believed sufficient for nearly fifty years of production.

•

Beacher Heads Southern Area

Dr. Robert L. Beacher has been named southern regional director for the National Plant Food Institute. His headquarters are in Atlanta, Ga. Formerly southwestern director for the institute, Dr. Beacher's responsibility has been extended to include 12 Southern States.

At the same time, E. K. Chandler was named NPFI district representative for the four southwestern states of Texas, Oklahoma, Arkansas, and Louisiana, His headquarters are at Shreveport, La. Mr. Chandler had been district representative for Tennessee, Alabama, and Mississippi.

6th Cornell Weed Day

The sixth annual Cornell Weed Day will be held July 20 and 21 at Ithaca, N. Y. The first day will be devoted to vegetable crops and the second to agronomy.

•

Named Witco Vice President

William J. Ashe has been named administrative and financial vice president of Witco Chemical Co., Inc., New York. He had been controller and assistant secretary.

Always before, this material had to be blasted. Then they bought a Michigan Tractor Shovel. It ended the trouble and

SAVED $34,000 per year

Ability of their Michigan Tractor Shovel to dig a material which always before had to be blasted is saving an estimated $34,000 per year for Davison Chemical Co, Bartow, Florida.

Together with its digging power, the Michigan also has proved mobile enough to work quickly in the same tight quarters as the smaller loaders it replaced.

The material being handled is triple super-phosphate—manufactured, stored and cured at this plant for at least four weeks. The Michigan is a Model 85A, 9000 lb lift capacity equipped with 1¼ yd bucket and replaceable bucket teeth. Its savings have been fourfold . . .

ONE, because the 96 hp Michigan can effectively load the hard-set TSP, Davison has eliminated all blasting.

TWO, the plant has traded in one of the two ⅞ yd tractor shovels previously used to handle the blasted material, moved the second to another job. This transfer has resulted in substantial savings due to the Michigan's lower maintenance cost and greater capacity.

THREE, no less than *12 men* (on a 3-shift basis) *have been transferred to other jobs* . . . 3 tractor shovel operators, 6 drillers, 3 dynamite handlers.

FOUR, with the elimination of blasting has come the elimination also of building repairs. No more are holes blown in the sides and top of the 25,000 ton capacity curing and storage shed.

40 to 45 loads moved hourly

Photo above shows typical operation. Like most loads, this one totals about 1¾ cu yds, 1800 to 2000 lbs. In seconds, the Michigan will turn, drive 25 to 150 ft, and feed the crusher hopper. Output, loaded by hopper conveyor into railcars, averages 40 to 45 Michigan bucket loads, 36 to 45 tons per hour.

Try Michigan on your job

Michigans, of course, can't *always* eliminate blasting. But they do have almost unbelievable breakout force (plus maneuverability, plus unexcelled dependability). We'll be glad to give you the proof of a demonstration. Seven 4-wheel-drive, two 2-wheel-drive models to choose from.

Michigan is a registered trademark of

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Benton Harbor 26, Michigan

In Canada:
Canadian Clark, Ltd.
St. Thomas, Ontario

Testing Grain Insect Kill

Insect kills from fumigation of stored grain may be determined with the "Bug Rope", a new development of H. T. McGill Co., Houston, Texas.

The "Bug Rope" is a hollow-core braided polyethylene rope, which will hold small cylindrical insect cages at any desired intervals. The rope with the insect cages is pushed into the grain mass with a metal probe rod. The metal tip of the rope also contains an insect cage for bottom-of-the-bin testing.

Once the rope is inserted in the grain, the probe rod is withdrawn for setting the next rope. A single probe rod can be used to set any number of ropes. Previously, many probe rods, each containing insect cages, had to be left in the grain during fumigation. This raised the cost of thorough checking to the point where it was practical only in research operations.

•

Grace Moves S.E. Office

W. R. Grace & Co., Grace Chemical Division, has moved its southeastern district sales office from Tampa, Fla. to 1402 E. Morehead, Charlotte, N. C. Lee Slusher continues as southeastern district sales manager.

EDITORIAL

(*From Page* 31)

The Department of Agriculture apparently stands ready to keep the farmer in business by payment of indemnities, but what of the rights of the producer of the product whose hard-earned reputation and good will are at the mercy of what is said in a press conference? Fewer pesticide manufacturers will now be willing to make the heavy investment required in the development of new pesticide products, unless they can be protected against capricious and unrealistic action by the Department of Health Education and Welfare.

Fortunately, a way out of the dilemma is now presented. A report has just been issued by the new Panel on Food Additives, appointed by Dr. George Kistiakowsky, president Eisenhower's special assistant for science and technology. It indicates that safe levels can probably be established for some carcinogens and suggests that the Delaney Amendment be revised to permit more scientific judgment in the future in the evaluation of food additives.

•

Pacific Agro Expands

Pacific Agro Co., Seattle, Wash., has established a Nursery, Greenhouse and Turf Division under the direction of Robert W. Moller, formerly manager of the State Flower Nursery, Inc., Kenmore, Wash.

FERTILIZER VIEWS

(*From Page 75*)

tial can be appreciated by considering their gross weight: conservative estimates of the total weight of this invisible population vary from 1000 to 5000 pounds per acre plow slice of soil. It has to be fed, and the supply must be maintained for high fertility purposes through large amounts of fertilizer.

The most important *inorganic* constituent of a soil pertinent to this discussion is *clay*. Every good, fertile soil must have a reasonable fraction of clay. Its importance to fertility is due to the negative electrical charge carried by the surfaces of its crystals. This attracts positively charged ions, which are held until removed by organisms or other more strongly charged cations. Calcium, magnesium, potassium, iron, zinc, copper, manganese and cobalt—all cations—are held on the clay and humus surfaces by electrical attraction, or by what soil scientists refer to as "base exchange capacity," and the cations as "replaceable bases." The size of this base exchange capacity determines how much of each of the nutrient cations may be retained in the available state by the soil against losses through leaching and other means. The limit of soil fertility with respect to the cations is defined by the magnitude of its base exchange capacity.

These positively charged ions on the clay surfaces are also subject to the pull of electrical forces on the plant roots: they travel to whatever force is the greater. Apparently, the plant seems to win. Soil physicists have their explanations for this apparent victory, but we shall have to skip the details.

From this viewpoint of feeding the soil, it is stated that it is not possible to feed the plant without first feeding the life of the soil. Nature seems to say that permanent fertility is accomplished by first satisfying the biological and colloidal requirements of the soil, and then maintaining that state. This viewpoint also emphasizes the fact that the so-called "fixation" of phosphate should be considered a boon to mankind, since its adsorption by the electrical forces of the soil's colloidal complex is a means of preserving it against loss while keeping it available as a plant nutrient.

Well, what is the conclusion of these observations? As Montaigne said: "Que sais je?" Who knows.?

Whether to feed the soil or feed the crop, it may be wise to make the best of the findings of the soil test and apply fertilizer generously to satisfy both the soil organisms and the crop. In this manner the highest returns per acre may be realized.★★

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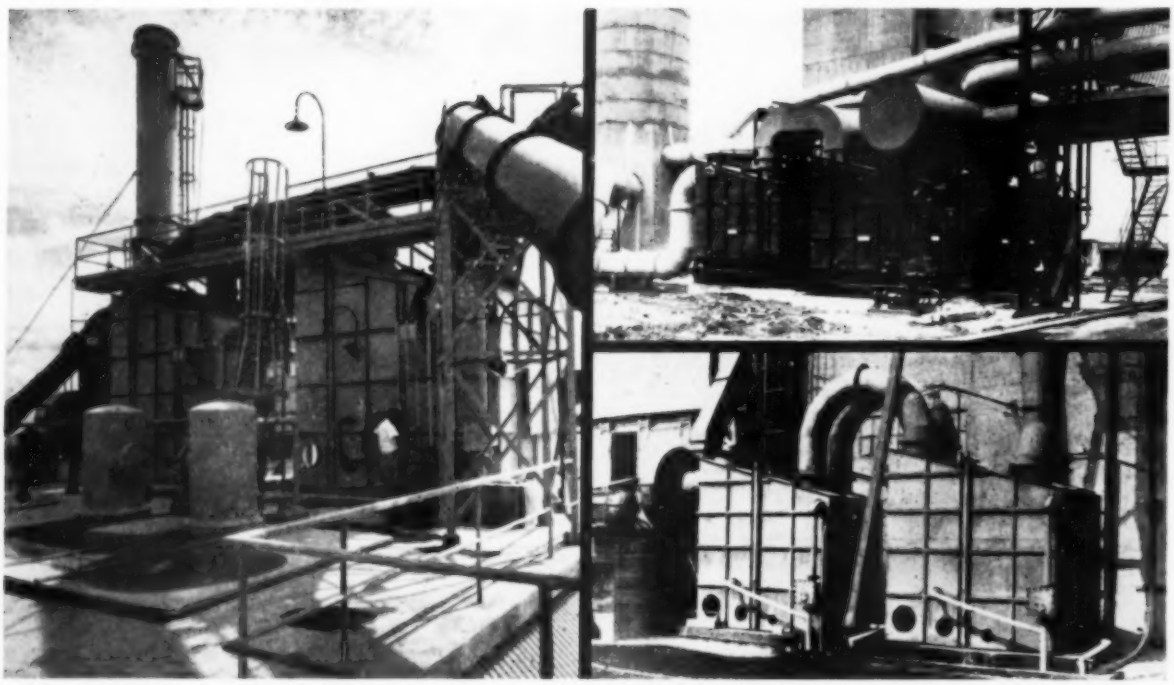

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Lower photo: Norske Zinkkompani A/S, Odda, Norway.

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WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

PESTICIDE FORMULATIONS

From Page 50)

stability of foam, deflocculation, and cake height after a given period. Generally, surfactants that cause excessive foam, which are slow wetting, or which do not deflocculate the sample may be eliminated by these compatibility tests. Several relatively good surfactant combinations are usually found, and these are then tested in more detail, particularly at different concentrations and at different water hardnesses.

The selection of ingredients to be included in these compatibility tests is a combination of "it-has-worked-before" and "it-was-on-the-shelf". The anionic or occasionally nonionic surfactants have generally proved to be the most successful. The lignon sulfonates offer an inexpensive source of efficient dispersing agents. Their main disadvantage is their dark color. Wetting agents are a different problem in that many of them cause excessive foaming. In sprayers of the agitation type, this can be a nuisance. The selection of wetting agents must sometimes be a compromise to minimize foaming and minimize wetting.

One very serious problem concerning laboratory evaluation of surface-active agents is not being able to predict their effect on biological performance. These ingredients will affect not only the preparation and deflocculation of the spray slurry, but also the droplet size of the spray, the initial spread and stick on the plant, and the retention or wash-off of the toxicant that is applied.[8] Thus, it may be necessary to select surfactants without determining the best products or the optimum quantity. A poor choice could lead to poor field results. It has been suggested by Hardman and Thomas that field tests should be related to the amount of toxicant found on the plant rather than to the amount sprayed.[1] This would at least allow better evaluation of the toxicant even if non-optimum surfactants were used. Successful results must then initiate a search for the best formulation.

5. Test Best Potential Formulations:

The fifth step is to evaluate in greater detail the one or more candidate surfactant combinations and concentrations found by the preceding steps. Test samples are prepared in small quantities of ¼ to 10 pounds by as close to a scaled-down production technique as can be simulated. The finished formulation is tested as extensively as possible in the laboratory. This can include particle size analysis, "before- and after-tropical storage" suspendability tests,[2] wetting time, foaming, surface tension, water hardness and temperature effects on suspendability, caking tests, screen analysis, stability tests, etc. The performance of the sample is checked against the added cost of formulation per unit of toxicant.

6. Submit Formulation for Biological Test:

The sixth step is the biological evaluation of the formulation. This is usually the pesticide manufacturer's part of this "cooperative" formulation project. The manufacturer is in the best position to run and interpret biological performance tests. If it is not possible to submit a formulation that meets all of the original goals, one or more alternative formulations may be presented. One of these may serve as an interim formulation, or the test results may show that the goals were unrealistic. In all cases, the practical, biological test should be made to see if a desirable formulation has been achieved.

After the results of greenhouse or field trials are compiled, it is again useful to get the interested personnel together to discuss the necessity or desirability of attempting to improve the formulation.

7. Large-scale Plant Trial:

With success in the limited field trials, the final step normally would be larger-scale production testing and extensive field testing. If the laboratory preparations were made realistically, and if the de-

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sired production techniques can be followed, the large-scale tests should proceed without difficulty. However, since some of the effects of quantity production, such as operating temperatures of large-scale equipment, are difficult to predict, production tests are very necessary when low melting point materials, such as pesticides, are involved.

The formulations used in production trials should be conservative in design. The per cent carrier in the formulation should be ample for good results. Although this may make the initial formulation more expensive than necessary, once satisfactory production runs have been made, the formulation can be adjusted to balance production cost and product performance.

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PRODUCTION ROUNDTABLE

(From Page 57)

indication of the soundness of those principles and the versatility of their use.

Demand For High Analysis Fertilizer

A major development on the farm scene is the trend to fewer and larger farm units, which calls for more labor saving ways. This is one of the factors contributing to farmer demand for additional new higher analysis grades. A farmer may be operating a two or three man unit. Adding another full man would seriously increase his labor cost. If a fertilizer grade can be provided which will eliminate the need for an extra application, or otherwise save labor, it is useful to the farm operator.

Another consideration is a competitive one. The dry blend-

ing of granular ingredients permits virtually unlimited proportions of the three major nutrients. Without discussing the many distinct advantages and equally distinct disadvantages, dry blending challenges the conventional mixed fertilizer plant, granular or pulverized, to meet the agronomic needs dictated by soil tests or agronomic research.

It is evident that the problem of finding an additional bin for another grade, outguessing the estimators as to tonnage and having enough of the right bags, tags or stamps ready will continue with us. I believe, however, that requests for special grades are becoming more intelligent, and are based on specific needs. Also, at higher levels of fertilization there is some tendency for soil differences to become less important. At these higher levels, there is a greater inclination to relate the fertilizer ratio to the intake by the crop to be grown rather than to the soil deficiencies.

In summary, there are trends which are tending to decrease the number of grades necessary, and there are others which are tending to increase them. The ultimate goal of one grade or even four or five is far in the future in most areas. The Ford Motor Company is a long way from the boast in their early days of being able to furnish any color car as long as it was black. I believe that we have less difficulty on multiplicity of grades than does the auto industry.★★

LISTENING POST

(*From Page 73*)

tion, reported results of experiments on the control of early blight (*Cercospora apii*) and bacterial blight (*Pseudomonas apii*), two foliage diseases that seriously affect celery production in the Everglades. 2,4-Dichloro-6-(*o*-chloroanilino)-*s*-triazine (sold under the trade name Dyrene) had been found to be effective against early blight, although costly. Tribasic copper sulfate in tank mixtures with the *s*-triazine was known to have an additive effect on control of early blight. Tribasic copper sulfate controlled bacterial blight to some extent. Thayer's experiments were planned primarily to determine the smallest amounts of the *s*-triazine and tribasic copper sulfate that could be used, alone or in combination, in sprays to control both diseases.

Thayer found that bacterial blight control was not appreciably improved when the *s*-triazine was added to the tribasic copper sulfate spray. For early blight the *s*-triazine alone at 1½ pounds per 100 gallons gave good control which was not improved by addition of tribasic copper sulfate. The amount of the *s*-triazine could be reduced to 1 pound per 100 gallons when 2 pounds of tribasic copper sulfate was added. The mixture

was less expensive than the *s*-triazine alone. For simultaneous control of bacterial blight and early blight, the amount of tribasic copper sulfate in the mixture should probably be increased to 4 pounds, according to Thayer. Copper zinc chromate proved to be as effective as tribasic copper sulfate in combination with the *s*-triazine. Sprays of *s*-triazine, used to control early blight in seedbeds, did not injure the seedlings.

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PEST ROUNDUP

(*From Page* 71)

Overwintering Survey

The annual survey to determine the potato psyllid population in the overwintering areas of the southwest was conducted during March. The potato psyllid is the carrier of yellows disease of potato and tomato and knowledge of the population in the overwintering areas gives an index as to the potential populations that can be expected in more northern states, particularly Utah, Colorado, and Nebraska. Wild *Lycium* is swept with a net to make the psyllid counts.

Potato psyllid counts this spring were comparable to those of 1959 in both Arizona and California. With the overwintering host being very abundant in areas surveyed in both states, there is a potential for severe outbreak populations west of the Rocky Mountains. Populations of the insect in the overwintering areas of Texas and New Mexico were down considerably from the 1959 survey. In only one district of this area were counts this year comparable to those found last season. Thirty-two psyllids per 100 sweeps were found in the San Angelo, Texas, district compared with 29 in 1959 and 219 in 1958. Host conditions were poor and indications were that the migration to Colorado, Nebraska and other areas east of the Rocky Mountains probably would not be very heavy. Spot checks in the Big Spring and San Angelo, Texas, sections in early April showed counts remaining at a low level.

Corn Borer Losses Down

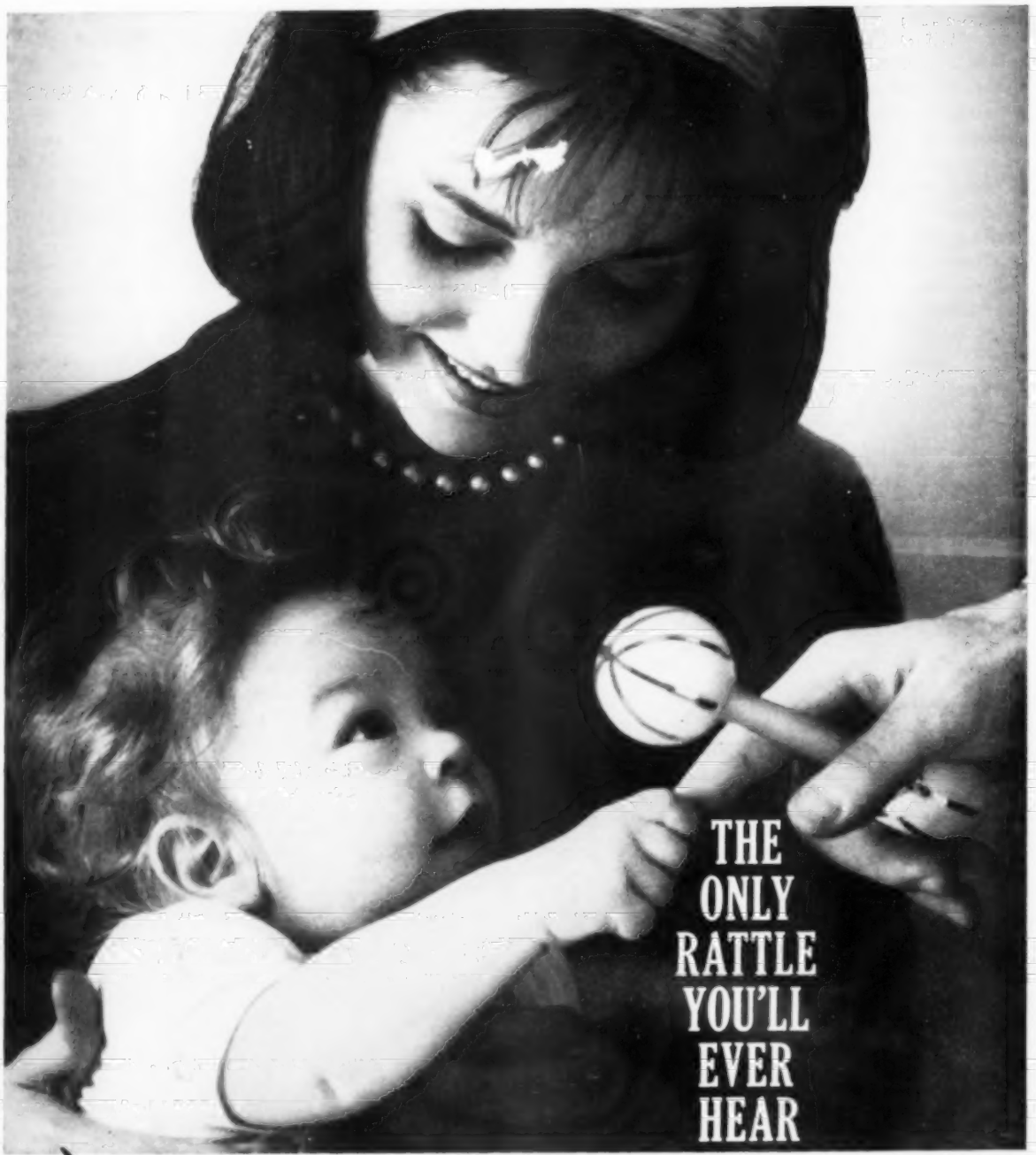
The loss of corn, grown for grain utilization, from damage attributed to the European corn borer in 1959 was estimated to be 67,763,000 bushels, from the 18 reporting states. The value of this loss, based on the season's average price, totaled $71,979,000, the smallest monetary loss since 1951 when the loss was $57,438,000. Loss in 1958 was estimated to be 100,699,000 bushels valued at $98,434,000.

Nebraska recorded the heaviest loss in 1959 with the dollar volume being $17,968,000, with Iowa having the second largest loss, $15,868,000.

The basis for the loss estimates was determined by the survey of European corn borer populations conducted by state personnel during the fall of 1958. The index of 3 percent loss per borer per plant was used to compute the loss in bushels.

Beet Leafhopper Surveys

To determine the beet leafhopper population that might move from the southwestern breeding areas to Nevada, Utah, and Colorado, surveys were conducted in Arizona and California during February and in New Mexico and Texas during March. The beet



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leafhopper is the carrier of the virus which causes curly top in sugar beets, beans and other plants. This early survey indicated that movement from Arizona to Utah, Nevada, and western Colorado probably would be light. Counts in the breeding area averaged 0.014 leafhopper per square foot of area sampled, as compared with 0.05 in 1959. A subsequent survey in April showed development of the leafhopper had advanced to the point where a light to moderate movement of the insect to southern Nevada, southern and eastern Utah and western Colorado is expected.

The beet leafhopper survey during March in the Texas and New Mexico areas showed average populations in both states to be lower than those in 1959. Host plants were plentiful throughout the area and, even though the counts were low, ideal conditions could produce a rapidly increasing population. A survey in the Arkansas Valley of Colorado during March showed the average population to be approximately twice that of last year, being 1.3 per 100 per square feet compared with 0.6. Host plants were far more abundant than at the same time in 1959 and leafhoppers were present at 60 percent of the stops, as compared with 20 percent of the stops last year.

The beet leafhopper survey in Idaho was conducted during March on the breeding areas that contribute to the spring migration into the seed bean-producing areas. In general, host plants were less abundant than in 1959 and the leafhopper population approximately the same. Nineteen leafhoppers per 100 square feet were found this spring, 17 in 1959, 16 in 1958, and 65 in 1957. Indications are that the migration of spring-generation beet leafhoppers that will move from the breeding areas of southern Idaho into the southwestern and Twin Falls area of that State will be slightly higher than in 1959, but lighter than in 1957. Host plant conditions, together with populations present, are such, in certain localized breeding areas, to warrant control applications.★★

APPLYING GRANULES

(*From Page* 66)

industry. In general, these devices should spread the granules as uniformly as possible over the area treated. In small plot tests, using attapulgite and 2,4-D pre-emergence treatments, five granules per square inch were as effective as 80. The number of granules required per square inch will depend on the toxicant, the carrier, the soil, and moisture conditions. Uniformity is important, but not critical, for the chemicals and distribution tested.

In 1960, at least three equipment manufacturers are selling planter attachments for applying granular herbicides. They all can be expected to do an adequate job of metering and spreading granular herbicides.

Proper care and calibration of application, of course, are essential for good results with granular herbicides. Chemicals and equipment should be purchased from reputable concerns, and the recommendations of experiment stations should be followed.★★

NEW FUNGICIDES

(*From Page* 37)

which can be disastrously severe in some peach growing areas.

The fruit industry has come to depend upon the newer organic fungicides for protection against infectious diseases of fruit and foliage. They have displaced older materials, because of superior disease control and lessened phytotoxicity, with consequent higher yields of quality fruit. This is not to suggest that all disease control problems have been met by them. More effective materials, fungicides effective against a wider range of fungi and better adaptability to mixed fruit plantings and fruit varieties would be welcomed.★★

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AVIATION PROBLEMS

(*From Page 70*)

a minimum of regulations. It was at this time that applicators, themselves, started to organize their own affairs. Several aerial applicators associations were formed. Among the goals of these groups were:

1. To achieve an equitable price per pound, gallon, or acre to make a decent living and properly maintain and replace equipment.

2. To strengthen acquaintances within the industry.

3. To promote the welfare and success of the business.

4. To exchange information and technical knowledge relevant to the advancement of the industry, and

5. To cooperate in the development of high ethical standards of business to further the recognition and worthiness of agricultural aviation.

Some of the results of this program have been the declining accident rate, which has dropped steadily from 439 in 1950 to 370 in 1957, while the hours flown has risen from 600,000 in 1950 to 865,000 in 1957. The fatal accident rate for 1957 was .50 per each 10,000 hours flown. In the eleven-state area where the vast majority of all agricultural aviation is concentrated, the accident rate (.45 per 10,000 hours) is far lower than for all other general aviation.

The total number of operators engaged in aerial application has leveled off at around 1,500. The total output of chemicals for 1957 was in excess of 720 million pounds of dust-type chemicals and over 90 million gallons of spray materials. These figures do not include the material used on cooperative USDA programs, which include rangeland and forest contracts.

A number of agricultural aviation conferences have been set up at leading universities and colleges and several applicator pilot training schools have been established.

Many problems, however, still require solutions to assure the continued growth and expansion of aerial application. Among them is the scarcity of surplus aircraft. There are a number of new and fine aircraft being developed for agricultural purposes, but they are, of course, somewhat expensive when compared with the surplus market on which this business was founded and still is geared. Before this industry can purchase a great number of the new airplanes, a realistic insurance and finance program will have to be found. The present insurance rates for full in-flight coverage are prohibitive.

State regulations for the industry are being prepared and, while the applicator now enjoys a relatively free position, it is necessary that preparations be made for the coming regulations. Federal regulations already are a reality.

There are a few steps, frequently mentioned by applicators, that the chemical industry could take to improve conditions under which applicators operate. It is no coincidence that these steps parallel those currently assigned major emphasis by the chemical industry, itself. Among the steps applicators would like industry to take is to furnish a fertilizer in pellet form in uniform bags. This may not seem to be of much importance, but some manufacturers quote a lower price for mixed fertilizers in dust form and in bulk or odd bagging and fertilizers of these types are more difficult to distribute accurately than pellets.

Applicators would like chemicals that are safer to handle and use. Some toxic chemicals are inexpensive and the applicator sometimes loses a sale if he refuses to apply them for a farmer. In addition to non-toxic chemicals, ap-

plicators would appreciate chemicals that are not as damaging to aircraft structures as are many present fertilizers and pesticides.

Chemicals that can be used under adverse weather conditions, such as invert emulsions; chemicals which do not leave excessive harmful residues on food crops; and more selective herbicides also are high on the list of developments desired by applicators.

There are approximately 5,100 aircraft used in dispensing chemicals on crops today, requiring 4,100 pilots and a total employment of approximately 20,000 people. More than 200 crops are treated from the air and one out of every six acres under cultivation in the U.S. is treated by air. The average applicator has a capital investment of $15,000 and many have an investment in excess of $100,000.

Agricultural applicators, however, are caught squarely in the middle of a price squeeze. With farm income on the decline, and the cost of aerial operations rising daily, applicators are in a most uncomfortable position. The price of aerial application still is at the 1949 level, which was based on the use of surplus aircraft. Applicators have been able to hold that price level through better and more efficient operations, but they have gone about as far as they can with the equipment and chemicals presently available to them.★

DISEASE CONTROL

(*From Page* 63)

Nevertheless, the advantages of aircraft application — the speed with which large areas can be covered, ability to reach otherwise isolated plantings, and absence of wheel damage to the crop — apply as much to disease as to insect control. Aircraft possess limitations too: flight is possible only under good weather conditions; proper landing strips are necessary; drift of the chemical is harder to control than when ground equipment is used; fixed-wing aircraft are economical to use only when rather large and fairly level areas are to be sprayed or dusted. Terrain also is a factor to be considered. Helicopters can be used in smaller areas and have some other advantages over fixed-wing machines, but they also have some disadvantages of their own (9, 13, 22).

Some crop diseases for which aerial applications have produced promising results in experimental work, or satisfactory control in practice, are late blight (*Phytophthora infestans*) of potato in Europe and North America (3, 8, 13, 17, 19), and of tomato in the United States (19); downy mildew (*Plasmopara viticola*) in Switzerland, Yugoslavia, and U.S.S.R. (11, 12, 29); brown rot (*Monilinia* sp.) of stone fruits in California (15); pecan scab (*Cladosporium effusum*) in southern United States (14); fire blight (*Erwinia amylovora*) of pear trees in the Pacific Coast States (10, 15, 24); powdery mildew (*Podosphaera leucotricha*) and scab (*Venturia inaequalis*) of apple in Washington State (24); cranberry rots (various fungi) in Massachusetts (30); sigatoka disease (*Mycosphaerella musicola*) of banana in Ecuador, the West Indies, and the Cameroons in west Africa (2, 26, 27); beet leaf spot (*Cercospora beticola*) in Switzerland (8); snow mold (various fungi) of winter wheat in Washington (24); and wheat rusts (*Puccinia spp.*) in Pakistan (6).

A great deal of research has been devoted to chemical control of cereal rusts, and aircraft have been employed in some of the field experiments (8, 16, 21, 23). The development of a safe, effective, and economically practical chemical for controlling cereal rusts seems probable in the future. When such a chemical does become available, the combination of aerial photo-survey to detect primary infection foci, epidemiological observations to determine the conditions under which control measures would be necessary, and

speedy aerial application over wide areas would provide the means to prevent the heavy, sometimes disastrous, losses hitherto suffered from attacks of these diseases.★★

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GUEST EDITORIAL

(*From Page* 31)

more than 30,000 soil fertility stories were used principally by County newspapers last year.

More than 56 projects have been conducted with state bankers associations to stimulate fertilizer use and to help develop better agricultural credit services.

The only nation-wide FERTILIZER SALESMAN'S HANDBOOK, (220 pages of scientific and sales information) has been published by the Institute. A similar handbook on safety in fertilizer plants is soon to be published.

Currently, intensified soil fertility programs are being supported by the Institute in 17 states, and this program is being expanded.

The National Plant Food Institute is dedicated to the sound and practical administration of programs that are first, worthwhile to farmers and next, valuable to industry. Generally both objectives are sought to be accomplished within the fertilizer use recommendations made by agricultural scientists and workers.★

NPFI MEETING

(*From page* 41)

of Causes" by Dale C. Kieffer; and suggested "Possible Remedies," by Albert Spillman.

On Tuesday morning, June 14th, a specialized presentation, related to operations at the fertilizer dealer level will be given by four speakers: Drs. Joseph Bohlen and George Beal will discuss characteristics of fertilizer dealers—both successful and unsuccessful—as indicated by their recently completed survey on the subject; Murray Renick will follow with the topic, "What a Dealer Should Know" in the field of business management; and Ralph Everett will conclude the program with "Everything Depends on Sales."

Twelve new directors and officers of the Institute will be elected at a meeting of the Board of Directors Wednesday morning, June 15.

Committee chairmen for the convention are: Memorial, Hugo Riemer, Los Angeles; Hospitality, Mr. and Mrs. William M. Clines, Los Angeles; Ladies', Mrs. J. D. Stewart, Jr., Anchorage, Ky.; Men's Golf, W. R. Morgan, New York City; Ladies' Golf and Putting, Mrs. L. Ralph Boynton, Bronxville, N.Y.; Tennis, W. E. Jaqua, Richmond, Calif.; Horseshoe Pitching Contest, A. A. Schultz, Reading, Pa.; Skeet, T. F. Bridgers, Wilson, N.C.; Bridge and Canasta, Mrs. Jack B. Snyder, Topeka, Kans.; Prizes, Mrs. Dean R. Gidney, New York City.

The Nitrogen and Potash Producers were to sponsor hospitality hours on Monday and Tuesday afternoons respectively.★

FLORIDA REGULATIONS

(*From Page 67*)

homeowners and agricultural users. An advisory council has been appointed, he said, to study and make recommendations concerning the present regulations and to assist in drafting additional regulations.

The advisory council is comprised of the director of the Agricultural Experiment Stations, the State Chemist, and one member each upon recommendation from each of the following groups: The Florida Medical Society; the Florida Pest Control Association; the Florida Turf Grass Association, a statewide organization representing commercial lawn and ornamental spraymen; and the pesticide formulating industry.

Besides requiring permits for commercial spray operators, the Florida law outlines the pesticide application techniques that may be used in residential areas and requires that personal warnings of impending spray be made to occupants of neighboring houses and that warning signs be posted on the property being sprayed.★★

CSMA REPORT

(*From Page 39*)

Mr. Coyne reviewed the effective date provisions of the law, and the various extensions. He also outlined registration requirements.

Mr. Coyne concluded his report, citing a change in organization of the Pesticides Regulation Branch, resulting from this amendment to the Federal Insecticide, Fungicide, and Rodenticide Act. Those dealers who market both agricultural and household materials will recall that one of the sections formerly was called the Fungicide-Herbicide Section, he said. Since the increased work resulting from the amendment would fall primarily upon that Section, it would result in an excessive concentration of the work in one group. Therefore, in the interest of facilitating the flow of applications for registration, and to lend as much specialized technical skill to consideration of these applications as is possible, the following reorganization has recently been effected. The Fungicide-Herbicide Section has been abolished. Two new Sections have been established. The first, the Herbicide and Plant Regulator Section, will review applications for registrations and certifications of usefulness for Herbicides, Plant Regulators, Defoliants, and Desiccants. Dr. E. A. Walker will be in charge of this Section. The other will be designated as the Fungicide-Nematocide Section, with Mr. E. P. Carter in charge.

We believe that this division will allow us to render more expeditious service to industry on applications for registration as well as the best possible consultation service to applicants and other interested parties, Mr. Coyne said.

Technical Data Reports

A CHEMICAL method to determine the presence of microgram quantities of thiocyanates in milk samples was described in a paper on, "Analysis of Milk from Cows Sprayed with Lethane 384," prepared by Charles F. Gordon, John Barker, Linwood Haines and Arthur Wolfe, all of Rohm & Haas Co. The limit of sensitivity for this method is .01 ppm Lethane. They reported that milk from cows sprayed with recommended maximum concentration and rates contained no Lethane. Residues of .005 ppm Lethane appeared only when the spray formulation and usage rate was equivalent to four times the maximum recommended dosage, and if the spray is applied directly to the animal's hide.

"Experiences with the Insecticidal and Toxicological Properties of 0,0 Dimethyl-2,2-Dichloro Vinyl Phosphate" were reviewed by R. L. Tracy, Norda Essential Oil and Chemical Co. He reported toxicological studies showed that the hazard of DDVP is related to the weight of acute intake rather than to repeated exposures to sublethal doses or metabolic deviation of the chemical in the body. Anticholinesterase activity in humans is insignificant from exposures to the vapors produced by 2 mg DDVP/ft³. Vapors in the homes of 18 human volunteers from repeated doses of .5mg DDVP/ft³ did not produce anticholinesterase depressions of erythrocytes or plasma over a period of about two months.

There is evidence, he said, that DDVP is rapidly detoxicated by the liver of animals and is not stored in body tissue.★★

SALES AND SELLING

(*From Page* 44)

technical service as is necessary to keep the customer,—and still make a profit. There is little doubt that technical service pays off. A customer will think twice about changing suppliers, even if a substantial price difference is involved,—if he can rely on various services from his supplier. In the agricultural chemical industry, one raw material supplier recently expanded his service program to his customers to include not only technical service for the product, but also assistance in training salesmen, obtaining credit, working out an advertising and sales program for the finished products. Results of the program thus far seem to be quite favorable, and the whole venture a success.

In the final analysis, it should be kept in mind that the sales program must be geared to the customer,—there will always be a market for Tiffany's, just as there will always be one for Woolworth. Some buyers in the agricultural chemical field are not interested in anything but the lowest price,—no matter how effectively side benefits are demonstrated. And too, it it must be realized that in the long run, the customer does pay for the extra service.★★

WASHINGTON REPORT

(*From Page* 59)

larger responsibilities as businessmen in keeping the free market and free enterprise in operation. A presentation on the political responsibilities of business will be made at the NPFI meeting by Arthur H. "Red" Motley, the new president of the U. S. Chamber of Commerce.

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A new regulatory problem facing the pesticide chemical industry concerns FDA's indication that formulation ingredients (diluents, solvents, surfactants, emulsifiers, spreaders, etc.), may be subject to the Federal Food, Drug and Cosmetic Act if residues are found to occur in the raw agricultural commodity or processed food treated with pesticide formulations.

NACA believes that these formulation ingredients, when incorporated with the active ingredient and marketed as a finished formulation, should be handled through the Department of Agriculture and the FDA in the same manner as the active ingredient . . . that is, subject to the Federal Insecticide Fungicide and Rodenticide Act,—and only when a residue remains would the chemical be subject to the Miller Amendment. On the other hand, inert ingredients which are sold alone in bulk to be added to the tank at time of spraying should be handled as food additives directly with the FDA if residues occur. NACA has urged industry to support this position.

Between now and the time a mechanism can be resolved for clearance of an inert ingredient, manufacturers are urged to collect data to support clearance action. Many of the materials are, of course, generally recognized as safe under any circumstance of intended pesticide use. In the case of others, it will be well to determine if residues will occur from their use, and whether such residues are safe.

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You won't find this on your regular calendar of upcoming events, but it may be important, particularly to pesticide manufacturers. HEW Secretary Arthur S. Flemming has called a national conference on water pollution for December 12-14, 1960.

Conferees will discuss all aspects and causes of water pollution and propose solutions. Frank Butrico, of the U. S. Public Health Service, has been assigned to work

CLASSIFIED ADVERTISING

Address all classified replies to Box Number, c/o Agricultural Chemicals, P. O. Box 31, Caldwell, N. J.
Rates for "Help Wanted" advertisements are 20¢ per word; minimum charge $3.00. Rate for individuals seeking employment is 5¢ per word, $1.00 minimum.
Advertisements of machinery, products and services accepted at rate of $10.00 per column inch. Minimum space, one inch.
Copy closing date, 10th of preceding month.
Checks must accompany all orders.

Help Wanted:

Chemist—experienced in formulations and quality control of Insecticides, Fungicides and Herbicides. Well established manufacturer located and operating in the Middle Atlantic area has need for two chemists in its current expansion program. Send letter stating training, experience and salary expected to Box 285.

AERIAL CROP DUSTERS AND SPRAYERS wanted throughout the world, earn top pay as applicator pilots. Learn at America's only veterans approved agricultural flying school. FAA approved flight school. Agricultural Aviation Academy, Minden, Nev.

For Sale:

FOR SALE: 1 — Sprout Waldron UNUSED 335 cu. ft. ribbon mixer, 50 cu. ft. ribbon mixer. 2—Robinson 125 cu. ft. ribbon mixers. UNUSED #9 Sturtevant rotary blender, 150 cu. ft. T304 st. st. dry material handling system including: 1800 cu. ft. weigh hoppers; AJAX "Lo-veyor" shaker conveyors, bucket elevators, screw conveyors, all st. st. Send for Details.
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Situations Wanted:

An executive or marketing position in the overseas division or international subsidiary of a sound and progressive American company which can use to advantage my broad experience and ability in coordination of domestic and foreign operations.
Technical background, — graduate agricultural engineer. Age 43. Spanish native language, fluent in English, Italian, French, Portugese.
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up the program. There are some indications that chemical companies will come under some fire.

The really new element in the White House report on the use of chemicals and drugs as food additives, released after approval by President Eisenhower's Special Assistant for Science Dr. George B. Kistiakowsky, is the stress on the value of "scientific judgment."

The report recommends that the Secretary of HEW appoint an advisory board to assist him in evaluating scientific evidence "on the basis of which decisions have to be made prohibiting or permitting the use of certain possibly carcinogenic compounds."

In the report's view, the advisory board should include scientists from USDA and the National Academy of Sciences, as well as from FDA and the National Cancer Institute. In a subtle way, the report is a move to prevent HEW Secretary Arthur S. Flemming or any future HEW Secretary from capricious administrative action which ignores sound scientific judgment.

The report, signed by a host of top-level scientists, stresses the fact that, "Americans today are better fed and in better health than at any time in history." And the report adds, "Greatest strides have been made during the past 50 years, partly as a result of the use of a broad spectrum of chemical substances in support of the entire pattern of food production, processing and preservation. These include: chemical fertilizers, insecticides, herbicides, antibiotics, preservatives, larvacides, fungicides, and hormones, among others.★★

Prior Local Approval Is Key To Successful Spray Programs

SPRAYING to control the gypsy moth in Connecticut is no haphazard scheme that may slaughter wildlife and endanger people or their food supplies, Neely Turner, state entomologist, explained in a public statement released last month in connection with spray programs in the state designed to control gypsy moths.

On the contrary, Mr. Turner points out, the Connecticut Statute on gypsy moth control represents the reasoned judgment of state legislators who weighed the evidence presented at public hearings and evaluated the results of spraying some 200,000 acres with DDT applied from airplanes over a period of four years.

Mr. Turner reports that "persons whose woodland and residential properties had been infested with the gypsy moth had their say. So did those who were properly concerned with the public interest in safeguarding food supplies, in conservation generally, and in the protection of fish and wildlife."

Connecticut law, enacted in 1955 after 48 years of experience in dealing with the gypsy moth in Connecticut, provides that the state entomologist shall designate the areas in which a gypsy moth outbreak threatens to reach epidemic proportions. The state entomologist notifies selection of the towns in these areas, and, in agreement with them, coordinates any spraying program the selectmen themselves authorize.

"Those who oppose spraying for gypsy moth control should present their reasons to the selectmen of the towns where they live or own property," Mr. Turner says. The decision to spray or not to spray private lands is made by elected town officials, not by any state agency.

Gypsy moth control on state-owned park and forest lands is the responsibility of the state. When a heavy infestation is found in one or more of these woodlands, aerial spraying is the one practical way now known to make these recreational areas serve their intended purpose in the early summer months, according to Mr. Turner. He also points out that many state forests now are improved and managed for maximum production of timber. Foresters and entomologists agree, he says, that protection from complete defoliation is a sound management practice.

The material found highly effective in gypsy moth control is DDT, applied in Connecticut at the rate of 1 pound to the acre, before May 26 to minimize any slight hazard to nesting birds. Contracts for spraying from airplanes provide for payment by number of acres covered, not by pounds of material applied.

Under the strict provisions of Connecticut regulations governing application of spray materials from aricraft there is, in Mr. Turner's opinion, practically no risk of injury to any person from DDT.

Operating procedures in areas to be sprayed from the air begin with a detailed mapping of the infested area to locate exactly all poultry and mink farms, vegetable fields, orchards, apiaries, reservoirs and other open water, pastures and hayfields. These areas are not sprayed.

So far as the hazard to wildlife is concerned, Mr. Turner says that extensive experiments were carried out in 1946 using DDT distributed from airplanes in a variety of situations. Biologists of Yale University and the State Department of Fisheries and Game examined the test areas before and after spraying. They reported that they found no mortality of either birds or fish following sprays that controlled caterpillars feeding on trees or mosquitoes in woodlands.

Since 1946, Mr. Turner reports, spraying more than 400,000 acres of woodland with aircraft has not caused a single verified case of death of birds.

More detailed information on "Insecticides and Wildlife" is available on request from The Connecticut Agricultural Experiment Station, Box 1106, New Haven 4.

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CACA Lists Speakers

The 8th annual meeting and conference of the Canadian Agricultural Chemicals Association will be held at the Britannia Hotel, Lake of Bays, Muskoka, Ontario, on Sept. 12, 13, and 14.

Addresses will include: "Evaluating New Pesticides" by Dr. F. Glen, director general, Research Branch, Canada Department of Agriculture; "Insect Resistance" by Dr. A. W. A. Brown, Department of Entomology, Western University, London, Ontario; "Tariff Reference 120" by J. A. Davis, chairman Chemical Industry Tariff Committee; and "Selling and Advertising" by Louis F. Czufin, California Spray Chemical Corp.

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Subsurface Herbicides

Subsurface application of volatile herbicides provides for better weed control than surface spraying followed by mixing, according to tests at the Mississippi Agricultural Experiment Station, Stoneville, Miss.

Using a two-row, rear-mounted cultivator-sprayer, EPTC was applied in a thin band under the surface of cotton seedbeds before planting. The result was 90 per cent control of weeds, compared with 74 per cent when the herbicide was sprayed on the soil surface and mixed with a rotary hoe. In some cases, the new method required less chemical, because the herbicide kills germinating seeds as it evaporates through the soil.

INDEX to ADVERTISERS

TALE ENDS

ONE of our staff was carried away with Olin Mathieson's new fertilizer plant,—said to be world's largest, —and reported last month in this column that capacity is 500 million tons per year. That's a lot of fertilizer. The plant is actually designed to produce 500,000 tons per year, — which is still a lot of fertilizer.

Our faces were a little red over the error, — however, we noticed that the *New York Herald Tribune* balled up the story even worse. In their May 12 h issue they printed a 3-column picture of the plant upside down, and to make matters even worse, placed the new plant in Pasadena, California, rather than Pasadena, Texas, where it actually is. Full details on this new high-analysis fertilizer plant appear on pages 34-35 of this issue.

AC

Another "accidental" discovery in the agricultural chemical field is reported by Clayton B. Fitzgerald of East Springfield, Massachusetts, who plans to produce a high-grade fertilizer in both a synthetic loam and in capsules of concentrated fluid. A tile and marble contractor since 1929, Mr. Fitzgerald said the basis of his fertilizer,—a chemical fluid,—was discovered accidentally while he was experimenting to improve portland cement. He hopes, he said, to market his product at a price "below the cost of any fertilizer on the market."— a rather depressing objective, which many fertilizer manufacturers agree their competitors have succeeded in accomplishing years ago.

Mr. F's fluid contains (he's not specific about percentages) silicon oxide, aluminum oxide, ferric oxide, calcium oxide, magnesium oxide sulphur trioxide, titanium oxide, potassium oxide and phosphorous pentoxide — fortified with bacteriated humus. This he will mix with fly ash and sawdust, which are certainly ingredients well calculated to keep cost down, although not perhaps to contribute substantially to plant growth. Mr. Fitzgerald has applied for a patent, and will operate his company under the name "Mag-Nitrate, Inc."

AC

Recently a group of sportsmen from the higher echelon of the insecticide industry visited the west coast of Mexico in search of something or other. They chose to remain unnamed, but the photograph below is evidence that at least one member (Pancho Toxapheno?) was serious in his search.

A non-technical member of the party was induced to comment, "Some tests were made of a new fish repellent to keep the fish from attacking cotton, tomatoes and salesmen." We hear that the search or research activities included the capture of nine blue marlin, one by each member of the piscatorial group, except for a Houston solvents sales executive who landed two, all the same day.

AC

Our friends in Washington tell us to be prepared for strict enforcement of residue tolerances allowed on foods. The Food & Drug Administration, they say, will be making seizures of DDT contaminated milk, — and will very likely propose a law, shortly, requiring manufacturers to prove the safety of their antibiotic products sold for injection into dairy cows.

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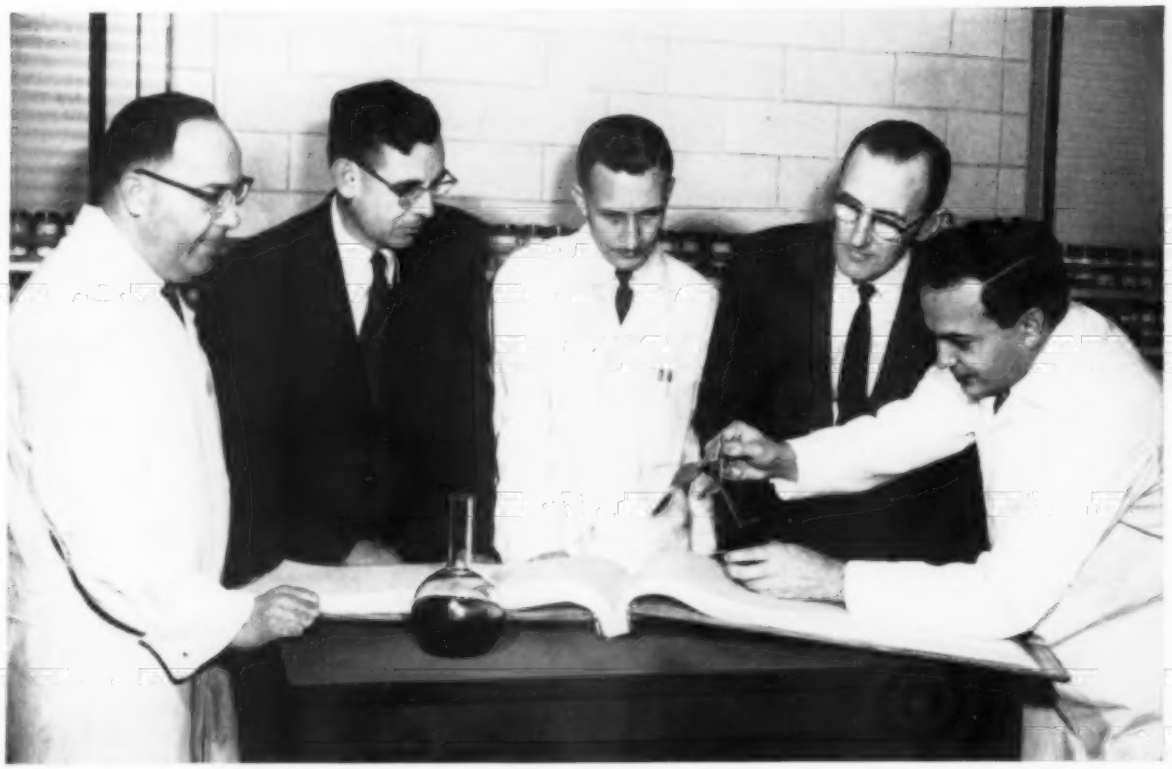

(Discussing promising new insecticide compounds at Hercules' Agricultural Chemicals Laboratory are: George Buntin, discoverer of toxaphene; Dr. E. N. Woodbury, laboratory supervisor; Dr. Keith D. Ihde, research entomologist; Dr. Arthur D. Lohr, supervisor, Naval Stores research; and Dr. William R. Diveley, a discoverer of Delnav.)

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Continuous research is carried on by Hercules Powder Company to find new chemicals for agriculture, and to find better ways to utilize the tools now available. Many of the people doing this work were engaged in the original development of toxaphene. Besides laboratory research, Hercules has placed great emphasis upon field testing and large-scale demonstrations. From such applied research in cotton insect control, for example, has come information to help farmers get better yields while lowering their production costs.

TOXAPHENE

Agricultural Chemicals Division, Naval Stores Department

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